The Chemical Age

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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1922-23

THE principal developments of the past year in chemical industry are reviewed generally and in detail with great thoroughness in the present issue. Dr. Maxted deals once more with the extremely important problem of nitrogen fixation, and traces the principal movements at home in comparison with competitive enterprises abroad. Sir William Alexander, who enjoys exceptional opportunities of understanding the industry from the inside, reviews the position of the British dyestuffs industry and offers some opinions as to its future. Professor Hinchley writes with confidence and adequate information about the comparatively new profession of chemical engineering, respecting which there has been some frivolous comment and—what is more important—much constructive thinking and organisation. Mr. P. Parrish discusses the principal developments in the important field of heavy acids and alkalis with an intimate understanding of its technical and scientific sides. Our well-informed Patent Correspondent supplies an interesting and valuable summary of the trend of chemical invention during 1922. The conditions in the chemical trade of the past year, with their embarrassing problems and fluctuations, are described with his usual knowledge and judgment by an authority widely known and esteemed in the trade. Finally, we publish a careful and comprehensive résumé of the year from the chemical point of view in general, with detailed accounts of the operations of the principal chemical societies and associations.

It is distinctly encouraging to find that the opinions of so many and so well-informed writers all point in one direction—namely, to a gradual abatement of the abnormal difficulties which have attended trade during the past year or two, and to a steady improvement in the prospects for the future. Trade to-day is obviously carried on with less risks and difficulties. Conditions generally are more stable. The business done is less of the hand-to-mouth variety, and traders are less nervous about entering into future commitments. Consumption is gradually increasing at home, and there are welcome signs that export trade is steadily improving. The outlook altogether is a distinct improvement on that we had to face twelve months ago, and if all the promises of better conditions are fulfilled, by the end of the year we shall have made a valuable approach towards the re-stabilisation of industry and trade.

With regard to the immediate prospects for 1923, there are several satisfactory features which should tend to an increase of confidence. In our commercial review it is pointed out that manufacturers of heavy chemical products have materially assisted industry and stimulated business by a reduction of quotations for next year's delivery. Equally satisfactory is it to find a better understanding between the manufacturing and distributing sections, which ought to produce equally good effects on both. The reports relating to export trade are all reassuring. The amount of inquiry at present on the market is described as distinctly greater than is usually the case at this period of the year, while orders are now being placed in this country by markets which had placed practically nothing for the past year or two. The effect of finance on business is illustrated by one incident. Only the other day while travelling in Germany our commercial reviewer was told of the case of a large order for fine chemicals which was offered to one of the leading German houses. This house was able to accept the order at a price about 15 per cent. less than that of English competitors, but was forced to stipulate that 80 per cent. cash should be paid with the placing of the order. This proved unacceptable to the buyers, who eventually placed their orders with an English firm at the higher figure on the terms of cash against documents at port of shipment. "This," as our correspondent remarks, "is significant and proves conclusively that the policy of inflation operated by some of the continental countries is only beneficial up to a certain point, and that in the end business is bound to revert to the country with a stable currency and one able to give normal trade credit terms."

If the good promise furnished for 1923 is to be realised, one of the essential conditions is industrial peace, both in the chemical industry and in all the staple industries of the country. Negotiation has been for some time proceeding as to a revision of chemical trade wages. For the moment a definite decision has been postponed. This in itself points to a reasonable disposition, and it is satisfactory to find from inside information that the matters in dispute are being considered with good judgment and good feeling on both sides. If these qualities are continued, one may hope that the steady improvement in the chemical trade of the country will suffer no disastrous check from a failure of understanding between employers and workmen. Another sign of some promise is the disposition to unite in efforts to make the claims of chemical industry better known to the public and amongst allied trades. At the British Industries Fair of last year the chemical section made an excellent show, and there is every reason to believe that at the exhibition to be organised in the New Year the impression will be even better. Apart from the actual results attained by organisation of this kind, the co-operative effort involved in carrying them through reacts most beneficially upon all engaged in the industry. Of no class is this more true than among that important section responsible for salesmanship, who have everything to gain by a fuller exchange of ideas and knowledge.

Something has been said in the past year about efforts to promote the larger utilisation of chemistry in industry. The recent proceedings in connection with the sale of cocoa containing an almost infinitesimal proportion of poison seemed to us to supply a very effective "peg" for impressing upon manufacturing and distributing firms the extreme importance of an adequate chemical service. In this matter there is a great deal of educational work yet to be done, and it may be modestly suggested that a concerted effort in this direction by our leading societies would bring more profitable results than highly speculative adventures which some of our societies are at present contemplating. Yet one more satisfactory point may be mentioned—namely, the steps which are now being taken for the establishment of recognised standards. This work is all part of a general movement tending to bring manufacturers into a more-co-operative relation, and therefore likely to result in a reduction of costs, an increase of efficiency, and better co-ordination of all the processes of manufacture. The situation, then, as a whole, though not yet fully restored, is moving steadily forward in the right direction, and the coming year may be looked forward to with a better spirit of confidence than any since the outbreak of war.

The Carbide and Cyanamide Position

If, in turning over the outstanding events of the year, one were to seek for sensations one's mind would surely turn to the cyanamide industry and the misfortunes which have beset it. Some ten years ago the interest which this comparatively new industry attracted was enormous, and it is not perhaps generally appreciated that at the end of the war the aggregate capacity of plant for producing cyanamide was considerably greater than that of any other nitrogen fixation method. Yet, at the present time, many of the most important works are closed—an unfortunate occurrence which is mainly explained by the fact that with prevailing costs of raw materials and labour the manufacture of the fertiliser is not a commercial proposition. The largest cyanamide works in the world is, of course, that erected by the American Government at Muscle Shoals; but Norway has always been considered the home of the carbide and cyanamide industry, and with the eight works (three of which were built during the war) which she possesses, she has in aggregate a capacity of considerable importance. Several of these works are completely closed down, and others are operating on a comparatively small scale only. Quite recently we find a well-known Norwegian electrochemical engineer remarking that the wartime optimism as to the future of carbide had proved to be without foundation, more especially so far as the manufacture of cyanamides is concerned; and, naturally, Norway is the main sufferer for the reason that she possesses carbide factories which have a capacity of nearly 80 per cent. of the pre-war world production. Conspicuous amongst the undertakings is, of course, the Alby Carbide Co., which erected plant at Odda, plant which, with an annual capacity of 75,000 tons, remained closed during the whole of the year. Towards the end of the year it was announced that this plant, as well as that of the North Western Cyanamide Co. (a subsidiary concern) had been sold by auction to satisfy a judgment, an incident which seemed to mark the final collapse of two of the most prominent industrial undertakings in western Norway. These plants employed about 1,100 men, and it is extremely doubtful whether they will ever again be in operation, although, of course, much might depend upon the discovery of new applications for both carbide and cyanamide.

Synthetic Nitric Acid a Luxury?

In spite of the ill-fortune which has overtaken the Norwegian industry one finds that in Germany there are plans afoot for an enormous extension of cyanamide output. This policy is a little difficult to understand, but when one tries to come down to facts there is no doubt that it is almost impossible to determine the actual cost of producing combined nitrogen by the more prominent methods which have been developed in Germany. For all that is known it is extremely probable that ammonia synthesis and oxidation is found to be rather too expensive a luxury, and there can be little question that cyanamide provides the cheapest form of combined nitrogen. Again, it may technically, but not necessarily economically, be a feasible matter to produce synthetic nitric acid; but assuming that the ultimate requirement is sodium nitrate, one would venture to ask how in Germany the soda for the purpose is to be obtained in sufficient quantities. There may, possibly, be some connection between the decision to double the output of the great Frank and Caro cyanamide works at Priesteritz and the fact that Germany has, under recent territorial rearrangements, lost an important plant at Chorzow. The latter works, which is now within the boundaries of the new Poland, has an

annual capacity of 120,000 tons of cyanamide, and furnishes the Poles with their only self-produced source of combined nitrogen. The passing of this establishment out of their hands has been a severe blow to the Germans, and one has heard almost amusing stories of the manner in which they have contrived to put every obstacle in the way of the new owners to preclude them from operating the plant. The Poles, in fact, are not the first people to discover that it is one thing to possess a German plant, but quite another thing to know how to use it.

There is, too, the question of effecting renewals when all the necessary spare parts are solely obtainable from Germany. In the case of the Poland plant we have heard various rumours about the refusal of the Germans to supply such things as electrodes, while the last information we had was to the effect that the assistance of French technical chemists had been invoked; but not, apparently, altogether with success.

Chemical Engineering Standards

WE understand that the Chemical Engineering Section of the British Engineering Standards Association is engaged upon the preparation of specifications for silicon iron and for iron suitable for the manufacture of pots for nitric acid and caustic soda fusions, and that panels of that Association are also considering the drawing up of specifications for chemical lead and for copper and its alloys for use in the manufacture of plant for the chemical and allied industries. The requirements of these industries as regards coarse and fine crushing machinery and screening plant are also under consideration as well as machines for treating plastic materials, such as paint mills, and it is proposed to consider other types of machinery which are of interest to the chemical engineer. A committee is dealing with steel drums and barrels with a view to the preparation of schedules of standard sizes, and this should result ultimately in a reduction in the number of types and sizes generally stocked by the makers of such containers. This should be to the general benefit by reason partly of the probable reduction in costs. A panel on gas cylinders has drawn up a scheme for the colouring of gas cylinders in order to indicate the nature of the gas contained in them, and the same panel is engaged upon the preparation of standard threads for valve stems and cylinder necks. The Association has ready for issue a specification for steam jacketed pans and is engaged upon the preparation of a specification for filter press plates and frames for issue at an early date.

Increase of Sulphate Prices

THE indications pointed out from time to time of an early further increase in the price of sulphate of ammonia are now officially confirmed. The British Federation announce that for the months of January and February the price to home consumers of sulphate of fine neutral quality, on a basis of 25¾ per cent. ammonia, will be £16 18s. per ton, and the price of ordinary quality 23s. per ton less. This is an advance of 5s. per ton on the autumn prices. It is stipulated that purchasers at these prices shall give an undertaking not to resell for export, but only for home consumption. As the prices for export for some time past have been considerably in excess of even the new terms and the demand continues strong, the Federation may be regarded as treating the home consumer generously in giving him preferential terms and also in recognising his prior claim on supplies. A delicate hint was given in our columns recently that home purchasers would be well advised to buy on the autumn prices instead of waiting in the hope of better terms of which there was never any real likelihood, and those who acted on the suggestion now find themselves 5s. a ton better off than others who delayed.

Points from our News Pages

New prices for sulphate of ammonia are announced by the British Sulphate of Ammonia Federation (p. 920).

Reviews are given of activity in various sections of chemical industry during the past year (pp. 914-936).

Some concluding impressions of his visit to America are contributed by Mr. F. E. Hamer (p. 937).

The theory of the Chamber process of sulphuric acid manufacture was the subject of a paper by Major C. Irwin (p. 938).

The feature of our London Market Report is the continued healthy condition of the export demand (p. 944).

A falling off in inquiries owing to the holidays is recorded in our Scottish Market Report (p. 947).

Books Received

THE RECOVERY OF VOLATILE SOLVENTS. By C. S. Robinson. New York: The Chemical Catalog Co. Pp. 188.

SECOND YEAR COLLEGE CHEMISTRY. By W. H. Chapin. London: Chapman and Hall, Ltd. Pp. 311. 15s.

SECOND YEAR COLLEGE CHEMISTRY LABORATORY MANUAL. By W. H. Chapin. London: Chapman and Hall, Ltd. Pp. 115. 7s. 6d.

FLAVOURING MATERIALS, NATURAL AND SYNTHETIC. By A. Clarke. London: Henry Frowde and Hodder and Stoughton. Pp. 166. 8s. 6d.

DISCOVERIES AND INVENTIONS OF THE TWENTIETH CENTURY. By Edward Cressy. London: George Routledge and Sons, Ltd. Pp. 458. 12s. 6d.

AN APPARATUS FOR THE MEASUREMENT OF SPECIFIC GRAVITY OF GASES IN SMALL QUANTITIES. Technical Paper No. 5. By Alfred Blackie. London: H.M. Stationery Office. Pp. 6. 3d.

The Calendar

Jan. 5	Society of Chemical Industry (Manchester Section). Short papers by members. 7 p.m.	16, St. Mary's Parsonage, Manchester.
8	Institution of Rubber Industry. "Plantation Rubber." P. J. Burgess.	London.
8	Society of Chemical Industry (London Section). Joint meeting with the Biochemical Society. "Micro-organisms and their Application to Industry and Research." 5-7 p.m., 8.15-10 p.m.	Institution of Mechanical Engineers, Storey'sGate, S.W.1
9	The Institute of Metals (Birmingham Section). "X-Rays and Crystal Structure." H. B. Keene. 7 p.m.	Chamber of Commerce, New Street.
9	The Institute of Metals (Scottish Section). Professor F. C. Thompson. 7.30 p.m.	38, Elmbank Crescent, Glasgow.
12	The West Cumberland Association of Chemists, Chemical and Metallurgical Engineers: "Steel Melting Furnaces and Their Equipment." B. Mason.	Workington.

1922: A Retrospect

Developments in Chemical Industry, Commerce, and Organisation

THE year now closing has witnessed, generally speaking, a decided and sustained improvement in the condition of trade and industry. Heavy taxation at home, the impoverished condition of a considerable portion of Europe, the difficulties of trading with Russia, and the fluctuating and extremely low value of some of the foreign currencies throughout the year again hindered the progress of many British industries towards pre-war prosperity, but in spite of all adverse influences a general improvement in trading conditions did occur, and a larger number of operatives were able to find employment. The low bank rate, the further reduction in the cost of labour and materials and the further recovery of workers of all classes from the mental disturbance engendered by the recent war all tended to induce manufacturers to undertake works of repair, alteration and extension, and to recommence operations which had become unprofitable under the trading conditions of the previous year.

Mr. Roscoe Brunner, speaking in June last at the annual meeting of Brunner, Mond and Co., Ltd., said that trade was undoubtedly improving, and mentioned that the work of erecting new chemical plant both at Billingham and at Wallerscote was proceeding apace. Later in the year many chairmen of industrial undertakings, chemical and other, spoke of the improving conditions of trade, and the recent report of the Castner-Kellner Alkali Co., for the year ending September 30 last, shows that the operations of that Company have been much more profitable than in the previous year. In October, Mr. Lloyd George, when opening the new offices of the Port of London, pointed out that for the preceding six months both the imports and exports of London were greater than in the corresponding period of the preceding year, the exports having increased more than the imports.

The extraordinary fall in the value of the German mark, and the great fluctuation in its value from day to day made commercial operations with Germany very difficult, and caused much disturbance in the industrial world. As Mr. Bush pointed out when speaking of the fine chemical trade at the annual meeting of W. J. Bush and Co., Ltd., the beneficial operation of the Safeguarding of Industries Act has been hindered by the abnormalities of foreign exchange, the fall in the value of the mark having led to prices being quoted from Germany with which it has been impossible for British firms to compete, even with the assistance of the import duty.

How the problem of preventing frequent and violent fluctuations in the value of certain foreign currencies will be solved remains to be seen, but the fact that so many British firms have been able to carry on operations at a profit under the conditions which existed during the present year justifies the expectation of yet greater prosperity as the disturbances caused by the war become more remote. The fact that Germany is now importing at heavy cost coal, coke and many raw materials required for her factories is already counterbalancing to some extent the advantage of the low cost, expressed in British coinage, of the labour she requires.

Safeguarding of Industries Act

A number of complaints under this Act have been heard by the Official Referee during the year, and the evidence given at these hearings has been reported at considerable length in THE CHEMICAL AGE. Much contradictory evidence has been given as to what constitutes a "fine chemical" within the meaning of the Act. In the decision issued in October last in the gallic acid case the Referee stated that he had previously decided that there is no scientific or trade definition of the terms "heavy" and "fine," and that, therefore, the trade classification is the test to be applied in each particular case. He decided that gallic acid is a fine chemical. The Board of Trade issued in October an Order imposing a 33⅓ per cent. *ad valorem* duty on imported mantles for incandescent lighting manufactured in Germany. Recently it has been decided that the Board of Trade, with the Department of Scientific and Industrial Research, shall make an investigation into all the key industries, so that the progress attained may be noted. The Act is considered to have been of material assistance to many British manufacturers, but is naturally disliked by most merchants who trade in foreign goods affected by the Act.

British Empire Patents

Australia, Canada, India, New Zealand, South Africa and the United Kingdom were represented at a Conference held at the Patent Office, London, in June. Representatives for the several Colonies and Protectorates were also present. The Conference was held to consider the practicability of instituting a system of granting patents which should be valid throughout the Empire. The Report of the Conference states that it was agreed to advise the adoption of a provisional scheme by which a patent granted under existing conditions in the United Kingdom should be extended to any of the territories desired by the applicant on payment of a simple registration fee, but the grant in that territory to be subject to the local objections and to local opposition. A specification accepted in the United Kingdom should, nevertheless, be held to be in conformity with local requirements as to sufficiency of description and claims. In Colonies or Protectorates where examination of applications is non-existent or perfunctory registration of the United Kingdom patent should follow as a matter of course. The Conference further recommended that steps should be taken to render patent legislation uniform throughout the Empire.

Food Analysis

A joint letter from the Institute of Chemistry and the Society of Public Analysts was sent in August to the Ministry of Health asking for modification or withdrawal of the Ministry's July circular No. 325. In this circular the Minister of Health suggested that in certain cases prosecutions for milk adulteration should be instituted only where a series of tests have shown repeated default. The reply to the joint letter stated that the advice given in the circular is limited to those cases in which a milk vendor has held a good record for a number of years and in which constant tests have always given satisfactory results. The Food Investigation Board continued its work on the investigation of preserved foods, and issued some interesting reports during the year. The report by Dr. Stiles on the preservation of food by freezing, with special reference to fish and meat, deals with a subject of general interest. Even after storage for several months the chemical changes in frozen food due to autolysis are apparently small and unimportant.

Adhesives

The first report of the Adhesives Research Committee has been published during the year and deals mainly with the nitrogenous adhesives—glue, gelatin and casein. No mention is made of the starch adhesives nor of sodium silicate. The issue of the report was followed by the publication of an interesting article by Mr. Rex Furness in the Journal of the Society of Chemical Industry on the properties and applications as an adhesive of sodium silicate. In this country, he says, several firms are using upwards of a thousand tons of this adhesive yearly, and in the United States its use is even more favoured. He gives much useful information concerning the methods of using the silicate. Silicate solutions can be prepared to meet all the requirements of a good adhesive, and their setting times can be varied over a wide range. They are odourless and do not become rancid. Unlike animal and vegetable adhesives, the silicate is fire-resisting and repellent to vermin. The silicate solutions have, he says, a relatively high bond strength and produce damp-proof articles. Dr. Schidrowitz has recently found that rubber latex vulcanised by a process of his own invention makes an excellent waterproof adhesive.

Petroleum

In Great Britain the search for natural supplies of petroleum has again failed to reveal the presence of any important reservoirs of oil. Oilfields of England, Ltd., have been continuing operations at Kelham, Notts, but have abandoned Well No. 1 for the present as a failure. Well No. 2 was reported a few weeks ago to have reached a depth of 1,636 ft. Little has been published lately concerning the work of English Oilfields, Ltd., which proposed to obtain oil on a large scale from the shale found near King's Lynn, Norfolk, but a licence to drill for petroleum in another area near

King's Lynn has recently been granted to the Pentney Syndicate, Ltd. From the D'Arcy well near Edinburgh a small quantity of oil has been obtained, and the Hardstoft well in Derbyshire has continued to flow at a rate of about three barrels per day.

In the United States and Mexico abundant supplies of petroleum continue to be found, and considerable reductions have been made in the price of crude petroleum and of petroleum distillates during the year. Much has been heard about the salt water invasion of the Mexican oilfields, but the tapping of new oilfields in Mexico has compensated for the diminished output from the older fields. The production figures for the year are not yet available, but during the first six months of the year Mexico had a record output, and it will probably be found that the output for the year has almost reached the record amount produced last year. The daily production in the United States has exceeded one-and-a-half-million barrels for several months past, and the production for the year will exceed all previous records.

The Anglo-Persian Oil Co., Ltd., has continued to obtain large quantities of oil from its older wells in Persia, and has found important new supplies within its Persian concessions in territory hitherto untested. Wells of moderate production have also been brought in on its South American properties. The Company has during the year imported into England large quantities of crude oil for treatment at its new refinery at Llandarcy near Swansea. The use of petroleum fuel oil for steamships and oil-engined ships has continued to extend, and the provision of waterside oil-storage tanks has become an important business.

In Burmah the drilling and producing operations of the Burmah Oil Co., Ltd., continue to keep their refineries fully occupied, but the chairman reported at the last annual meeting of the company that deeper drilling had become necessary on the older fields, and little success had attended the company's boring operations on fields outside Burmah.

In Barbadoes the British Union Oil Co. is now producing about 300 barrels of petroleum per day, and has decided to establish an oil bunkering station at Bridgetown.

In Canada the well of the Imperial Oil Co. at Fort Norman has been flowing at a rate of about seventy barrels a day, so the existence of an oilfield in this cold region may be regarded as proved. The depth of the well is about a thousand feet.

In France, on the Pechelbronn field, crude oil is being obtained at the rate of about 70,000 tons per annum. In addition the older fields of Eastern Europe are again yielding large supplies of oil, so there does not appear to be any danger of a fuel oil shortage in the near future.

The world's total production of crude petroleum for the year 1921 amounted to rather more than 765 million barrels of about 35 imperial gallons. The United States produced 61.7 per cent., and Mexico 25.3 per cent., of the total. No other country produced as much as 4 per cent. of the total.

Candles, Limited

A company known as Candles, Limited, has recently been registered. The ten directors represent important industrial interests, and include directors of the Anglo-Persian and Burmah Oil Companies, the Asiatic Petroleum and Shell Transport Company, Lever Brothers, and Price's Patent Candle Co. The company has been formed for the purpose of acquiring the businesses of various dealers in illuminants and lubricants, and will manufacture and deal in oils, greases, glycerin, oleine, etc. The influence of the company will probably be felt in the paraffin wax market.

Kent Coal, Coke and Iron

In July a Board of Trade inquiry was held concerning the proposal of a scheme for supplying certain rural districts in East Kent with gas produced in coke-ovens from Kent coal. The gas is to be distributed under high pressure with reducing valves where necessary if the scheme be carried out. Mr. Robinson, the manager of the Chislet colliery, when giving evidence, said that his colliery was bringing to the surface 4,250 tons of coal per week. A large percentage of the coal compares favourably, he said, with that of Durham and Northumberland for coke ovens. His company proposes to erect thirty coke ovens capable of dealing with 900 tons of coal per day and intend to erect them as soon as the amount of coal raised is sufficient to keep the ovens supplied. The Tilmanstone mine of the East Kent Colliery Company has also been bringing to the surface about 4,000 tons of coal per week for some time past.

A new company known as Pearson and Dorman Long, Ltd., a combination of important engineering interests, has been formed during the year to put down two shafts at Bettes-hanger, near Deal. It has been found that metallurgical coke of good quality can be produced from some of the Kent coal, and it is believed that the steel producers of Northern France will purchase large quantities of Kent coke. Much of the coal already raised at Chislet has been transported to France. If necessary, iron ore from Normandy and Brittany can readily be imported into Kent, but as large deposits of iron ore have been found in Kent itself it is probable that use will be made of this in the production of Kentish iron and steel.

Basic Slag

An interim report made to the Minister of Agriculture by the permanent committee appointed by him some time ago to consider methods of improving and extending the use of basic slag shows that the basic slag now obtainable contains only about half the percentage of phosphate present in pre-war slag. The quality has deteriorated owing to the use of the open-hearth process of steel manufacture in place of the Bessemer process. The committee is making a careful inqury into the fertilising value of ground mineral phosphates, and hopes to be able to show that low grade basic slag may with advantage be mixed with mineral phosphates.

Rubber and Arghan

The long period of depression in the rubber plantation industry showed signs of coming to an end towards the close of the year. For some time the selling price of rubber was about sevenpence per lb., a price at which many plantation companies were selling at less than the cost of production. In the concluding months of the year the price rose to about fourteen pence per lb., and most companies can make a moderate profit when selling at that price.

A new use for rubber latex has been described by Mr. F. Kaye, who has discovered that all grades of paper may be improved and made waterproof by using a small proportion of rubber latex in the manufacture of the paper. The latex is readily miscible with water in all proportions, and contains from 30 to 35 per cent. of rubber. A paper on the subject was read by Mr. Kaye before the Institution of Rubber Industry in September.

Dr. Schidrowitz has discovered a process by which crude rubber latex can be converted into vulcanised rubber without being first submitted to coagulation, washing, drying, and mastication. The vulcanised latex is coagulated and then used in the same way as ordinary latex coagulum.

In July Lord Colwyn opened the new laboratories of the Rubber Research Association at Croydon. These include a miniature factory for preparing and vulcanising rubber.

Arghan Company, Ltd., is a company formed to trade in the fibre known as Arghan. This fibre is said to be superior to either cotton or flax, and arrangements have been made for a number of rubber companies to co-operate with the Arghan Company by cultivating the plant from which the fibre is obtained on their estates.

Therms

The new system of charging for gas in accordance with its value in therms instead of by volume in cubic feet has not yet become generally approved by consumers, although it has been extensively adopted by gas undertakings in all parts of the country. Under the old system gas had usually to be maintained above a minimum illuminating or calorific power, but the ordinary consumer did not, as a rule, concern himself with that. In July last some consumers found themselves faced with a gas bill heavier than that anticipated and came to the conclusion that the system of charging on a therm basis was responsible for the unexpected growth of the amount to be paid. The absurdity of such conclusion is, of course, obvious to all who have had any scientific education. A therm is the exuivalent of 100,000 British thermal units, and no change in the quality of the gas can alter the heating value of the therm, so comparison between undertakings supplying gas of different qualities is more useful when comparison is made of the charge per therm than when comparison is made of the charge per thousand cubic feet. During the year reductions in the charge per therm have become general, many reductions having been made within the last six months, and there can be little doubt that as the quarterly gas bills approach

nearer and nearer to pre-war figures the new system of charging will become less unpopular. At the end of November a Departmental Committee of the Board of Trade was appointed to inquire and report as to the method of charging for gas on the thermal basis, and the committee has been taking evidence on the subject in London during the present month. The inquiry will be continued next month.

Sulphate of Ammonia

The British Sulphate of Ammonia Federation, Ltd., is continuing its useful propaganda work, and is making strenuous efforts to reduce the cost of manufacture. Speaking at the annual meeting of the Federation in November, Mr. Milne Watson, the chairman, said that the present price of sulphuric acid is still about 100 per cent. above the pre-war price, and would have to be reduced if sulphate of ammonia makers were to adjust their cost of production to the level of the selling price for nitrogen which might be expected in the not very distant future.

The membership of the Federation represents a manufacturing capacity of about 300,000 tons of sulphate per annum, which is over 90 per cent. of the total British production. In referring to the fact that Synthetic Ammonia and Nitrates, Ltd. has decided to join the Federation, Mr. Watson said that he thought it a great triumph for the idea underlying the Federation that such an important new producer should have decided to take this step at so early a stage in its operations.

German Fixed Nitrogen

In a paper dealing with the nitrogen fixation industry, which he read before the British Association in September, Dr. J. A. Harker pointed out that by the end of the year Germany would possess plant for the production of about 500,000 tons of fixed nitrogen annually. She will thus be assured of the basic materials for a gigantic production of munitions, and he warned the Allies to take care that whilst Gretna and almost all our own munition works are being dismantled the world is not caught napping a second time.

Home-Grown Sugar

Working arrangements for the amalgamation of Home Grown Sugar, Ltd., with the English Beet Sugar Corporation, Ltd., have been made, and it has been announced that the sugar-beet crops grown this year for the Kelham (Notts) factory are to be treated at the Cantley (Norfolk) factory of the latter Corporation. The Kelham factory was erected during a period of high costs for labour and materials, and with sugar at its present price it is not surprising that the factory could not pay heavy excise duties and be worked at the same time at a profit. In order to give the industry a chance of establishing itself in this country the late Government agreed to abolish, for the present, the excise duties on sugar and molasses made from home-grown materials. By keeping one factory working at full capacity, instead of having two factories not working at full capacity, it is probable that more economical working may be effected. The Kelham factory can be used and extended as the industry expands. The land planted with sugar-beet amounts to 3,776 acres at Kelham and 4,180 acres at Cantley. The Cantley factory employs 600 men.

Helping the Workers

The dread of being left in old age without employment and without means of subsistence darkens the lives of many workers as physical and mental powers begin to deteriorate. Much has been done by many large industrial firms within the last forty years to remove that fear by the introduction of a system of pension and co-partnership; but this year has been marked by the adoption by Lever Bros., Ltd., of a scheme by which every co-partner will have a life assurance policy and be insured against total loss of income through unemployment or temporary sickness. Each of us, said Lord Leverhulme when addressing his co-partners at a recent meeting, lives in fear of unemployment, fear of sickness, and fear of death without provision having been made for dependents. The scheme his firm has adopted to alleviate these fears provides that: (1) No money contribution shall be paid by the co-partner; (2) half wages (including any State allowance) shall be paid during unemployment due to slackness of trade; (3) half wages shall be paid in case of sickness up to a period of four weeks, after which period the case will be further considered; and (4) a life assurance policy shall be presented to each co-partner, the company to pay all premiums. The success of the scheme must obviously be dependent upon the ability of the co-partners to maintain the financial stability of the undertaking; but so long as they can do that the operation of the scheme will remove for the workers at Port Sunlight some of the most common anxieties of life.

The Chemical Societies

The various chemical associations have been very active during the year, and it is pleasant to be able to record that co-operation with American chemists is extending and becoming more intimate. The Society of Chemical Industry has for many years been a bond of union between American and British chemists, and now the Chemical Society is about to co-operate with the American Chemical Society and the Faraday Society in the issue of the *Journal of Physical Chemistry*. Dr. Parsons, the secretary to the American Chemical Society, paid a visit to England during the year, and advantage was taken of his presence to complete the negotiations for co-operation between the societies. Sir James Walker, president of the Chemical Society, announced in October that from some future date, probably January, 1924, the *Journal of Physical Chemistry* will be issued under the auspices of the three societies. The editorial board will consist of four American and four British representatives together with an editor-in-chief appointed by these eight representatives.

Dr. E. F. Armstrong, as president of the Society of Chemical Industry, has attended meetings of chemists in various parts of the country during the year, and, like his predecessor, Sir William Pope, has vigorously insisted on the necessity for friendly co-operation between chemists of all descriptions. At Bristol he said that he regarded the formation of any new chemical society as a potential disaster to the community of chemists. The organisation of chemists compares badly, he said, with that in America and Germany, and there should be only one society, with sectional groupings if necessary. The Chemical Industry Club continues to flourish. Its membership has increased, its financial position is good, and it is doing excellent work in bringing together men interested in chemistry and chemical industry.

Some reduction in the number of members was shown by the last annual report of the British Association of Chemists, but it still has over a thousand members, and has been doing helpful work for chemists generally. At the annual dinner of the Association, which was held in Manchester, Dr. E. F. Armstrong said that, as president of the Society of Chemical Industry, he wished the B.A.C. every possible success and promised it all the assistance the Society could give.

Much has been heard recently about overcrowding in the chemical profession, and both the B.A.C. and the Institute of Chemistry have been active in finding employment for chemists seeking engagements. The Institute has been in correspondence with the Minister of Agriculture concerning the practice of State-aided colleges conducting analyses for fees below those at which professional chemists can profitably undertake the work.

The Association of British Chemical Manufacturers has continued its highly important political and protective work, especially in connection with railway freight charges. Early in the year it organised a thoroughly representative chemical exhibition as a section of the British Industries Fair held in London at the White City. Sir John Brunner, who presided at the sixth annual meeting of the Association, justly claimed that the formation of the Association was a great stroke of work for the chemical industry.

The third International Conference of Pure and Applied Chemistry was held at Lyons in June. Among other things, it was agreed to recommend benzoic acid as the thermo-chemical standard for use in standardising calorimeters. The standard benzoic acid may be obtained from the Institut International d'Etalons Physico-chimiques at Brussels. The fourth conference is to be held in Cambridge in June next.

Obituary

In the list of chemists who have passed away during the year the following well-known names occur: C. Baskerville, J. W. Bottomley, Crum Brown, F. D. Brown (of N.Z.), W. S. Curphey, W. Gowland, E. H. Grove-Hills, A. Hill, G. Hislop, E. W. T. Jones, W. Kellner, H. Larouche, A. McWilliam, Alexander Smith, E. Solvay, J. Stenhouse and J. Takamine.

The Nitrogen Industry in 1922

By E. B. Maxted, D.Sc., Ph.D.

THE outstanding features of the past year in relation to the nitrogen industry have been, firstly, the large number of papers from American sources dealing with the methods employed in Government institutions and factories; secondly, the remarkable speed with which the rebuilding of the Oppau synthetic ammonia factory has been carried out, and, thirdly, the very welcome news that the large synthetic ammonia plant of Synthetic Ammonia and Nitrates, Ltd., at Billingham, is definitely expected to commence operations within the next six months. In addition to work on the fixation of nitrogen by other methods, further details of the Häusser process are now available. The advantage of this process lies in the possibility of employing it on a small scale; but its economic success would appear to be largely bound up with the utilisation of the mechanical energy of the explosion, either by means of an engine of the type suggested by Humphrey or in some other manner. A process in which so much available energy remains unutilised is obviously open to great improvement, and it is along these lines that the industrial future of the Häusser method will probably lie.

The problem of the most suitable ammonium salt for industrial manufacture continues to receive attention. Ammonium nitrate, both alone and in conjunction with ammonium sulphate, will long remain in disfavour on account of its deliquescent properties, and by reason of the danger of the explosion even of double salts, in the light of the Oppau disaster. In the meantime, particular interest is attached to the conversion of ammonium carbonate into urea. Carbon dioxide is usually a waste product in the manufacture of hydrogen for the synthesis of ammonia; and the fixation of this ammonia without the use of an extraneous acid—especially an acid of little or no agricultural value, such as sulphuric or hydrochloric acid—presents many attractions.

Certain problems in connection with the fixation of nitrogen were dealt with at a special discussion held by the British Association at its Annual Meeting at Hull.

As a convenient bibliography of the nitrogen industry for 1922, the following papers and patent specifications, published during the past year, may be included :—

Synthesis of Ammonia

While the number of patent applications for catalysts and for modifications of plant is not so great as in previous years, special furnaces for use at very high pressures have been described by L'Air Liquide in Brit. Pats. 171,970 and 171,972 (THE CHEMICAL AGE, Vol. 6, p. 117), by Casale and Leprestre in Brit. Pats. 176,144 and 185,179 (THE CHEMICAL AGE, Vol. 6, p. 464 and Vol. 7, p. 502), and by the Soc. Chim. de la Grande-Paroisse in Brit. Pat. 177,777 (THE CHEMICAL AGE, Vol. 6, p. 744). Especially at very high pressures, the exothermic nature of the synthesis renders necessary the removal, rather than the supply, of heat to the reacting gases when once the furnace has attained a suitable temperature. This condition is indicative of the great advances which have been made in the synthesis since the early work of Haber and his collaborators, in which an intensive system of electrical heating was required to obtain a continuous reaction. Claude (*Compt. rend.* 1922, *174*, 681) has discussed this question of cooling in detail. Liquid cooling baths, consisting of a molten metal or of a liquid boiling at about the temperature employed for the synthesis—for instance, sulphur, with or without the addition of substances to raise its boiling point—may be used; or the cooling may be effected by short-circuiting a portion of the circulating gases in such a way that these do not pass through the circuit heat exchangers, in addition to which the thickness of the wall of the catalyst chamber may be raised so that more intense cooling occurs at the portion corresponding with the first layer of catalyst, in which region the greater part of the combination occurs. The construction of ammonia synthesising furnaces has thus, by reason of the possibility of autothermic working, been reduced to what probably represents the simplest possible form, after passing through the preliminary period which occurs in practically every process of unusual type.

A welcome series of articles by Larson, Tour, Newton and Hawkins (*Chem. and Met. Eng.*, 1922, *26*, 493, 555, 647, 683) deals with the experimental and manipulative side of ammonia synthesis, with particular reference to the work of the United States Fixed Nitrogen Laboratories at Washington. When the writer visited this institution last year, he was greatly impressed by the facilities which existed there for an intensive study of the synthesis, and with the work which was being carried out; and this publication of some of the results which have been obtained is of the greatest interest. A description is given of testing plant for determining the activity of catalysts at various pressures. The papers also contain data relating to the sensitiveness of a number of catalysts to traces of carbon monoxide or water vapour, and to the activity under various conditions of catalysts containing iron.

The Nitrogen Corporation (Brit. Pat. 180,314; THE CHEMICAL AGE, Vol. 7, p. 719) protects the use of a catalyst containing a carbon-nitrogen compound (for instance, a cyanamide) of magnesium or beryllium, in conjunction with iron or certain other metals. The catalyst is used in the form of briquettes, the reaction temperature being 400–500° C. A further catalyst (Nitrogen Corporation, Brit. Pat. 179,155, THE CHEMICAL AGE, Vol. 7, p. 24) consists of an alkaline or alkaline-earth salt of an organic acid, for instance, potassium or calcium oxalate or tartrate, or barium carbonate. These are prepared for use by being heated in dry ammonia to 350°-1000° C., preferably with the addition of salts such as iron oxalate, manganese carbonate, cobalt acetate or uranium acetate. It is usually difficult to deduce from patent specifications the actual catalyst which it is proposed to employ in practice; but, in any case, it would seem that iron is being universally adopted as a base, the principal difference between the various catalysts employed lying in the nature and mode of introduction of the promoters. It may be noted that the Norsk Hydro-Elektrisk Kvaelstofaktieselskab (Brit. Pat. 171,976, THE CHEMICAL AGE, Vol. 6, p. 117) propose the protection of catalysts containing pyrophoric iron by treatment with water vapour or carbon dioxide. Treatment with carbon dioxide is similar to the procedure sometimes adopted with pyrophoric catalysts used in oil hardening. Treatment with water vapour would appear to be unusual, since this inhibits the activity of the catalyst.

Other Methods of Nitrogen Fixation

Further details relating to the Häusser process for the synthesis of nitric oxide by the explosion of gaseous mixtures under pressure have been given by Häusser (*J. Soc. Chem. Ind.* 1922, *41*, 253R), and by Goodwin, Annual Meeting, Brit. Association (THE CHEMICAL AGE, Vol. 7, p. 414). It is shown that relatively large explosion bombs lead to higher yields of nitric oxide than are obtained with bombs of small capacity, probably by reason of the higher temperature attained. Thus, with a 100 litre bomb, a yield of about 67 grams of nitric acid per cubic metre of coke oven gas was obtained, whereas, with a 300 litre bomb, the yield rose to 100 grams. Corrosion difficulties were not encountered, and the trial plant was shown to be capable of regular and uniform operation. Häusser's calculation of the absorption space required for the elimination of oxides of nitrogen from the exhaust gases under various pressures is of special interest, not only in connection with the explosion process of nitrogen fixation, but also in relation to absorption generally. It is calculated, for instance, that if the absorption of the oxides of nitrogen by water be carried out at a pressure of four atmospheres, the absorption space will only be about 1/60th of that required at atmospheric pressure.

A concise summary of the technology of the Bucher process has been published in this journal (THE CHEMICAL AGE, Vol. 6, p. 99). In particular, the catalytic influence of the iron added, the reversibility of the process, and the methods employed by the U.S. Bureau of Mines are discussed. The results of large scale experiments on the Bucher process have also been described by F. E. Bartell (*J. Ind. and Eng. Chem.*, 1922, *14*, 516, 699). Producer gas could not advantageously be used in place of nitrogen, on account of its carbon monoxide content. The carbon was employed in the form of petroleum coke, the optimum temperature for the fixation process being 1,050° C. The effect of temperature on the products of

hydrolysis of the cyanide briquettes is of interest. At a low temperature (100–200° C.) sodium formate is formed. Above 200° the product is sodium oxalate and, above 400°, sodium carbonate. Bartell considers it advisable, therefore, to effect the hydrolysis under conditions such that sodium carbonate is formed, since this can be returned to the cyanide plant. As far as the writer is aware, no data are available on the conversion of these other salts of sodium into cyanide, but it would seem probable *a priori* that their passage into cyanide could also be effected.

The real difficulty of the Bucher process seems to be, as stated in last year's review, mechanical—on account of the corrosive nature of the fused alkali cyanides—rather than chemical. This also applies to the synthesis of barium cyanide, a reaction which has received repeated attention since the date of its first investigation by Margueritte and Sourdeval. In the past year, work has been contributed by Askenasy and Grude (*Zeitschr. f. Elektrochem*, 1922, *28*,130), who have studied in considerable detail the influence of the time of heating, of the temperature, and of the nature of the carbon used. Relatively short times of heating appear to give satisfactory results. For instance, a yield of 95 per cent. of the theoretical value was obtained after 15-30 minutes at 1,600° C. It was found advisable to compress the charge before hearing, in order to obtain a better contact between the solid reactants. Cyanide formation takes place also with impure nitrogen containing carbon monoxide, but the yield of cyanide is reduced by this impurity.

The subject of the formation of titanium nitride and its conversion to ammonia has been re-opened by a patent of Andreu and Paqui (Brit. Pat. 175,989; THE CHEMICAL AGE, Vol. 6, p. 602). Titaniferous iron ores are mixed with carbon, and with the salt of an alkali or alkaline earth, and are heated to 1,850° C. in an atmosphere containing nitrogen.

Koenig and Hubbuch (*Zeitschr. f. Elektrochem.* 1922, *28*, 202,) contribute further data relating to the fixation of nitrogen as hydrocyanic acid by subjecting a mixture of a hydrocarbon and nitrogen to the action of a magnetically deflected arc. Under favourable conditions, the yield from a mixture of hydrogen, nitrogen and acetylene may reach 11 grams of HCN per K.W.H. Deposition of carbon is avoided by choosing suitable proportions of the reacting gases, and particularly by employing a large excess of nitrogen. Work on the combination of acetylene and nitrogen has also been carried out by Garner and Matsuno (*J. Chem. Soc.* 1922, *121*, 1729).

Ammonium Salts

The development of the manufacture of neutral sulphate of ammonia has been summarised in a convenient form by Parrish (THE CHEMICAL AGE, Vol. 6, p. 97). Since the active introduction of the subject in 1917, many more or less successful processes for this purpose have been suggested. Further details relating to the production of neutral sulphate by the treatment of acidic crystals with ammonia are published by E. V. Evans and the South Metropolitan Gas Co. in Brit. Pat. 174,878 (THE CHEMICAL AGE, Vol. 6, p. 321). The crystals produced in the saturators are usually too fine to be neutralised with ammonia in a centrifuge, while, if they are stirred with ammonia solution, loss by solution occurs. The crystals are therefore stirred with a mother liquor which has been made sufficiently alkaline with ammonia to produce a neutral sulphate. J. B. Hansford (Brit. Pat. 173,818; THE CHEMICAL AGE, Vol. 6, p. 208) utilises a set of two saturators connected in series in such a way that the production of a mother liquor containing no free acid in the first saturator is not accompanied by loss of ammonia. Treatment to obviate the discolouring of neutral ammonium sulphate is described in Brit. Pat. 176,977 (South Metropolitan Gas Co. and Parrish; THE CHEMICAL AGE, Vol. 6, p. 525). The source of the colour is to be found in the pyridine which is evolved from pyridine sulphate on treating commercial ammonium sulphate with ammonia. This evolution of pyridine is avoided by a special method of working, for details of which the original specification should be consulted. Other methods and plant for the production of neutral ammonium sulphate have been proposed by Marr and The Coke Oven Construction Co. (Brit. Pat. 187,320; THE CHEMICAL AGE, Vol. 7, p. 758). and by Holmes and Cooper (Brit. Pat. 187,035; THE CHEMICAL AGE, Vol. 7, p. 714.)

The stability of ammonium nitrate both alone and in the form of double salts is of considerable interest in view of the Oppau disaster. It has now been definitely shown that ammonium nitro-sulphate, particularly in a compressed condition, may be exploded by a picric acid primer. The slow decomposition of ammonium nitrate at lower temperatures has also been studied by Findlay and Rosebourne (*J. Soc. Chem. Ind.*, 1922, *41*, 58T). The salt is stable at 100° C. when free from foreign matter. In the presence of oxidisable organic bodies, such as wood meal or starch, slow decomposition, with formation of free nitrogen and carbon monoxide takes place. It is interesting to note that this decomposition may be prevented by the addition of urea.

While urea is not an ammonium salt, its production from ammonia and carbon dioxide, as a method of fixing synthetic ammonia, may conveniently be considered here. The Badische Anilin und Sodafabrik (Brit. Pat. 181,884; THE CHEMICAL AGE, Vol. 7, p. 130) propose heating a highly concentrated solution of ammonium carbonate externally by means of steam at a pressure of 12 atmospheres. Ammonia, carbon dioxide and steam are evolved and pass through a cooler, in which the ammonium carbonate condenses to a liquid which is not allowed to solidify, by being maintained above 110° and below 150° C. The molten salt is run into an autoclave heated to 130-150°, urea being produced. The transformation of ammonium carbamate into urea, from the standpoint of the equilibrium involved, has also been studied by Matignon and Fréjacques (*Compt. rend.* 1922, *174*, 455). Thoria, alumina and silica have a slight accelerating effect on the reaction. The Société d'Etudes Chimique (Brit. Pat. 179,544; THE CHEMICAL AGE, Vol. 7, p. 58; see also Brit. Pat. 151,596) effect the transformation of free cyanamide into urea by treating a concentrated solution of this body with sulphuric acid, or with a salt such as sodium nitrate. The corresponding urea salt is formed and may be crystallised out, or the mixture may be used directly as a manure.

Nitric Acid and the Nitrates

A number of fresh papers deal with the production of nitric acid from Chile saltpetre and by the oxidation of ammonia. M. F. Chase contributes a description of a U.S. Government plant employing nitrate of soda as a raw material (*J. Ind. and Eng. Chem.* 1922, *14*, 677); further, an interesting description of the technical manufacture of nitric acid by heating sulphuric acid and sodium nitrate under diminished pressure has been published by Mason (*Chem. Zeit.* 1921, *45*, 1161; ex *J. Soc. Chem. Ind.* 1922, *41*, 11A). It is stated that it is possible to reduce the nitrous acid content to 0·2 per cent., and to obtain a nitric acid efficiency up to 99 per cent. A suitable working pressure is about 10 in. of mercury below atmospheric pressure. Several papers giving a general description of the manufacture of nitric acid by the oxidation of ammonia at various experimental stations are of interest. An account of the work of the Sheffield Experimental Station, Alabama, on the oxidation of ammonia, is given by H. A. Curtis (*Chem. and Met. Eng.* 1922, *27*, 699). Among the points discussed are the effect of iridium in the platinum catalyst on the yield of nitric acid, the use of ammonium nitrate solution in the absorption towers, and the acceleration of the reaction between nitric oxide and oxygen by activated carbon. Imison and Russell (*J. Soc. Chem. Ind.* 1922, *41*, 37T) have given a detailed description of an ammonia oxidation plant at the works of the United Alkali Co. A multiple platinum gauze, without electrical heating, was employed as a catalyst, preheating of the reaction gases being effected by means of an enamelled iron heat exchanger. The absorption of oxides of nitrogen is also discussed, and figures are given indicating the working costs. This paper is of interest as an example of the results obtained in British practice.

The absorption of the oxides of nitrogen formed by the oxidation of ammonia has been treated by Hall, Jaques, and Leslie (*J. Soc. Chem. Ind.* 1922, *41*, 285T) in an article on the design and capacity of nitric acid towers. The curves and mathematical relationships, expressing the optimum ratio between the absorption and the oxidation space, should be of considerable general utility. The Société Anonyme L'Azote (Ger. Pat. 342,412) describe an interesting method of separating oxides of nitrogen from gas mixtures containing these. The gases are passed over anhydrous alumina cooled to a tempera-

ture between 0° and 80° C. The addition product formed evolves pure oxides of nitrogen on being heated, preferably under reduced pressure.

Of nitrates, sodium nitrate is of course of paramount importance from an industrial standpoint. According to an improved process of extracting this from caliche (THE CHEMICAL AGE, Vol. 7, p. 675) the crude material is ground until it will pass a ¼ in. mesh, when it is heated to a relatively high temperature. It is next placed in a battery of gyratory drums, having filter-cloth sides, through which, in series, a hot aqueous solution passes. It is claimed that the method gives a far higher yield than that normally used.

Review of the British Dyestuff Industry in 1922

By Sir William Alexander, K.B.E., C.B., C.M.G., D.S.O.

(Chairman, British Dyestuffs Corporation, Ltd.)

THERE is probably no industry, the development and prosperity of which depend so completely on the success of other industries. Dyestuffs are not directly used as such but almost entirely with reference to their application to, or incorporation with, other materials. The ways in which dyestuffs are used are extremely varied and numerous, and in normal times this is an advantage, as curtailment in one direction may be made up by increasing use in another. In times, however, of general trade depression the dyestuff industry is particularly hard hit. It is, in fact, a very sensitive barometer responsive to every fluctuation in the health of the industrial state. It is thus necessary, before attempting a review of the part, to indicate in general terms the conditions under which the whole is existing to-day.

Much was expected of 1922, but it cannot be said that the high hopes entertained have been realised. There is, however, no ground for the deep pessimism entertained by some which can only prove inhibitive of hopeful effort. True, there is no strong and beneficent wind of prosperity blowing as yet, but there are the proverbially useful " straws " which, to the observant eye, indicate the probability of better things.

1922 saw a continuation of the process of 1921, namely, the forced liquidation of accumulated stocks. In no industry was this accumulation more marked or more harmful than in the dyestuff industry. As is well known, the Sankey judgment opened the door wide for a considerable time to the importation from abroad, and mainly from Germany and Switzerland, of very large quantities of dyestuffs on which the industries concerned have been able to subsist. Here, as also with regard to other stocks, the end appears to be well in sight, and 1923 ought to offer a field for endeavour which has been sadly lacking during the past two years.

Export Trade

The recent Board of Trade figures show an increase in exports, and there is evidence that the demand for some of our goods is increasing in countries like South America. India has had the tonic of the Monsoons, and the volume of imports in the period of July to September this year was greater by more than one-third than that of any similar period in the past year and a half, and almost double that of the corresponding period of 1921. The trouble in India has been due largely to the heavy value and quantity of high-priced goods left over from the period of high exchange for the rupee.

In the recent address of the President of the Manchester Chamber of Commerce he stated that our export trade has increased in volume to 66 per cent. of that of 1913 as against the 46 per cent of 1921, and this is a very notable recovery. Another point of importance is the fact that the disposal of Government Stores has been on a smaller scale, and that this trade-disturbing factor is on the way to elimination. We have also the high authority of the President of the Board of Trade who stated last week from the masses of evidence before him that trade is quite definitely beginning to revive and, further, that the revival is not confined to any particular branch of industry. Another possibility of improved conditions should arise from the amalgamation of the big railway companies, and through the elimination of waste, due to unproductive competition, arises a possibility of cheaper transport. On the other side of the balance sheet as far as export trade is concerned must be noted the new United States Tariff which, whatever its result, cannot fail to make trade with the States more difficult for us.

There are, however, other factors so uncertain in their nature and in the scope of their action and reaction that they render the task of the prophet more ungrateful than usual. But these factors must be faced. There is first the total inability of most of Europe and of the Near and Middle East to buy from us owing to the depreciated currencies and to the wild fluctuations in rates of exchange which affect not only Germany and Austria, but even France. Some of these countries can pay in kind for goods received, but this is not always desirable, as some of these goods are products which could be made in this country, and their introduction would only tend to increase the already large volume of unemployment. The main difficulty, however, is of another kind, and due to the lack of a reliable standard of barter in the absence of the usual gold medium. It is impossible, for instance, to grade fairly and with mutual satisfaction the exchange of, say, wheat, of which there may be a score of qualities, against steel.

With regard to Germany, it is extraordinarily difficult to arrive at any real estimate of her condition financially and industrially. The rate of exchange ought to allow Germany to export large quantities of goods to her advantage, but does not appear to do so in any overwhelming degree. There is no real evidence of extensive dumping. It may well be that the severe fluctuations in exchange make it difficult for her to quote. In any case Germany remains as a very serious disturbing factor, not so much because of what she is doing, but because of the uncertainty as to what she is really able to do and as to what she may attempt. Germany has been able to secure important contracts for steel rails and for electrical equipment, and in dyestuffs she is particularly active in India and China. All these conditions make it highly desirable that we should strive to improve the internal trade within the frontiers of the Empire.

As a result of the war, the Empire is more self-sufficing than it was, and it contains practically all the necessary raw materials within its borders. Before the war Germany largely dominated the dyes and chemical industries, the fine spelter industry, the manufacture of electrical equipment, and, with Austria, the glass industry. This is no longer so to-day. The links of Empire have to be strengthened. To-day, with regard to dyestuffs, Australia is the only Dominion offering imperial preference. In India, undoubted preference has been shown to American, Japanese and German wares. The attitude of Canada is not yet fully defined. We need a much better understanding leading to the development of imperial trade, not only by exchange of products but through the development of all raw material resources.

Prospects for 1923

What are the prospects for 1923? Politically there is no doubt that the great majority of Englishmen, irrespective of party views, welcome a return to Party Government in the place of a Coalition Government, for which many felt an instinctive dislike. We can all understand what the present Government stands for, and it can be supported or opposed along clear and intelligible lines. This will tend to make for what Mr. Bonar Law calls, in a catch-word of more meaning than some, " tranquillity." The Government is already devising means of improving trade. The trade credit scheme has been extended. Efforts are being made to reduce unemployment, and orders have been placed for two capital ships and for the making of certain roads. Further, an Imperial Conference has been summoned which will deal with trade problems.

No survey would be complete which did not refer to the United States. I have recently returned from a visit to the States, and there is every evidence that America is going ahead at a great rate with the development of her own

resources, and is actually suffering from a shortage of the less skilled labour. In the dyestuff industry some of the companies called into existence by the necessities of the war and post-war periods have gone under, owing either to insufficient capital or probably more often to inadequate technical skill. The advance in the States is due very largely to the peaceful atmosphere following on the settlement of strikes in different branches of industry.

With regard to labour in this country, in spite of unemployment and much vocal effort on the part of extremists of the Labour Party, there is an atmosphere of peace. The disastrous results of the miners' strike have not been forgotten. It is generally realised that strife is detrimental to common interests. There was much talk during the recent general election of a capital levy, and there were many crudities and absurdities in its advocacy. It is true that income tax touches capital, but it takes toll of potential and fluid capital, while a levy would cut deeply into static and vital capital.

A strong representation of Labour is much to be welcomed in the new Parliament. It offers a constitutional platform for the necessary voicing of Labour opinion, and there is already evidence of the good effect on the Labour members of association with moderate men of other parties. This must in time lead to the apprehension that the common object is that of national industrial development and prosperity. In general, confidence is increasing and for many reasons, some of which have been offered, the prospects of 1923 are of better trade.

Record and Prospects of the Dyestuff Industry

As has already been stated, the dyestuff industry is peculiarly sensitive to the ups and downs of other industries, and the volume of its trade responds automatically to the increase or shrinkage of trade in general. There are, however, several satisfactory features about the record of 1922. The accumulated stocks of dyestuffs to which reference has been made are on the way to liquidation. The industry's own very large stocks of intermediates are gradually disappearing. These stocks had depreciated in value and involved the industry in great loss, while rendering impossible the manufacture of fresh and better supplies, for it must be remembered that these stocks were made and accumulated during the boom period which followed the war, and that they were made at a time when it was not always possible to give the necessary attention to quality, the effect of which was to lead to colours which, admittedly, were not always beyond reproach. The industry in this country has realised, as never before, the supreme importance of intermediates of a high degree of purity which result in higher quality and better yield of the colours manufactured. The year has seen a great improvement in the quality of the colours made in preceding years, and it is known that complaints from consumers with regard to quality have been much reduced. Further, the various dye manufacturing concerns in this country have been responsible for the introduction, not only of colours which have never previously been made here, but also of some entirely new groups of colours of great usefulness.

The necessity for economy and for low cost of production has been fully realised, and by means of intensive research and elaborate costing it has been found possible to make better use of raw materials, to produce better and in some cases new intermediates, and to find outlets for by-products. The total elimination of waste in the dyestuff industry is not an easy matter, but the efforts are meeting with an increasing measure of success. The dissemination of information about the products of the industry, the rendering of expert technical assistance to the consumers, the issue of improved pattern cards, are all matters which have received attention and which, although not yet perfect, show a steady improvement which will be more fully realised in the coming year. The dyestuff industry also realises its duty to the community along lines which are not those of ordinary trade. It has done a great deal, and will yet do more, in supporting the efforts of those who are trying to establish a fine chemical industry in this country. It has not been unmindful of the demands of academic research, and has done a great deal to supply some of the wants of the laboratories of our Universities and Technical Institutions. The industry is realising more fully the usefulness of its products in the service of medicine, surgery and public health generally, and by collaboration results have been achieved in 1922 which lead one to be very hopeful as to the future.

The dyestuff industry in this country finds itself at the end of 1922 as conscious as ever of the great difficulties in the path of its establishment, but better equipped, better informed, and better led than at any time in its history. It has faith in itself and is willing to make its contribution to the common good, but it must also have grounds for faith in the strong and sustained help which the Government alone can render. It cannot be emphasised too strongly that the attainment of a satisfactory state of things depends on intelligent co-operation, on mutual helpfulness, on ungrudging labour and on a high ideal with regard to the ultimate goal.

Sulphate of Ammonia

Advance of 5s. a ton on Autumn Prices

THE British Sulphate of Ammonia Federation, Ltd., announce an increase upon the official price fixed for last autumn of 5s. per ton for home agricultural use for January and February of 1923. In their circular just issued to the trade the Federation state :—As attempts have been made to buy supplies at the home price and to resell for export, please obtain a guarantee from your buyer that he will use the sulphate of ammonia you sell to him on his own farm. Quantities bought at the home price stated below, which is considerably under the export price, may not be exported under any circumstances. Our contracts will contain a clause binding buyers to pay to us a large additional sum per ton in respect of any quantities exported. The unit value of nitrogen in the price stated below for neutral quality is about 16s., and corresponds to a price of about £12 10s. per ton for nitrate of soda. When the price of nitrate is £13 per ton at British ports sulphate of ammonia is worth well over £18 per ton delivered. The bulk of our deliveries will henceforward be of neutral quality, but we reserve to ourselves the option of delivering ordinary quality in some districts, subject to the allowances in price stated below.

We are reserving the whole of our March and April production for home use, but this quantity will not be sufficient to meet a normal demand, and it is therefore essential that you should place orders for a substantial part of your spring requirements for delivery in January/February, if delay is to be avoided later. We still have limited quantities available for December delivery at 5s. per ton less than the price stated below.

We offer to sell sulphate of ammonia for home agricultural use at the following prices :—For January and February delivery, 1923, £16 18s. per ton for neutral quality in fine friable condition, free from lumps, basis 25¾ per cent. ammonia. Delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of 4 tons and upwards. Limited quantities of ordinary quality will be available in some districts, and will be sold at 23s. per ton less than the above prices, basis 25¼ per cent. ammonia.

Relation between Molecular and Crystal Symmetry

AT the last meeting of the Physical Society of London, Dr. A. Russell in the chair, Mr. G. Shearer read a paper on "The Relation between Molecular and Crystal Symmetry as shown by X-ray Analysis." The lecturer pointed out that the methods of X-ray analysis enable the number of molecules associated with the unit cell to be determined. With the help of this information an attempt was made to connect the symmetry properties of the crystal with this number and with the symmetry properties of the molecules from which the crystal was formed. The symmetry number for each of the 32 crystal classes was given, and was shown to mean the minimum number of asymmetric molecules necessary in the unit cell to satisfy the symmetry conditions. The relative orientations and positions of these molecules in the cell were discussed. It was suggested that this symmetry number was the actual number of molecules in the cell when the molecule was asymmetric; further that, if the molecule possessed symmetry, this symmetry appeared also in the crystal, and the number of molecules in the unit cell was obtained by dividing the symmetry number of the crystal by the symmetry number of the molecule.

Developments in Heavy Acids and Alkalis

By P. Parrish, A.I.C.

THE progress made in the heavy chemical industry during the year under review can hardly be regarded as of a sensational character. Advance resulting from the greater appreciation and practical application of research of manufacturing operations is governed in some degree by the state of trade. In times of trade depression there is a natural reluctance to resort to plant modifications and alterations stimulated and revealed by physico-chemical experimentation.

Although there has been an improvement of trade in several directions, it can hardly be said that the clouds which permeated activities during 1921 have been dispersed. Such progress or advance as merits record is of the " slow but sure " order.

Heavy Acids

Sulphuric Acid.—Broadly speaking, two systems hold the field for the production of chamber acid. Hitherto one has been chary in dogmatising as to which system possesses a preponderating advantage. The old type of rectangular chamber, the leadwork of which is supported by a skeleton framework of wood or steel, continues to vie with the more intensive systems, such as the O.P.L., Duron, and Mills-Packard water-cooled tower chambers. Each of these systems has peculiar merits. But the flexibility in point of production, and the potentialities for low nitre consumption of the older type of plant are points of distinct commendation.

Moreover the circulation of acid and/or cooling water for the tower chambers is avoided, and by judicious design wear and tear of the lead can be reduced to a minimum.

The intensive system of sulphuric-acid manufacture, as patented by M. Kaltenbach, is not yet working on a practical scale. The question of the suitability of materials has arisen. When this problem is finally solved more will doubtless be heard of this process, which combines water-jacketed cooling with intensive contact of the sulphur dioxide and other gases with nitrous vitriol, which is circulated through the tubes constituting the reaction section of the plant.

The use of iron oxide shafts between the burners and Glover tower does not appear to have been developed further to any considerable extent. There are distinct potentialities here, and these ought not to remain latent, or only partially exploited.

Much valuable data bearing on the control of, and the underlying principles connected with, these shafts are to be found in volume V. of the Technical Records of Explosives Supply, published during the current year by the Ministry of Munitions, and the Department of Scientific and Industrial Research. These records will adequately repay careful study.

Continuous mechanical sulphur burners have been adopted at one or two works throughout the country, and satisfactory results from the points of view of labour costs and uniformity of working conditions have followed.

Spent oxide as a raw material in the manufacture of sulphuric acid is deservedly receiving increasing attention. This material is eminently suited for the manufacture of this mineral acid. Its almost complete immunity from arsenic, its ready combustibility, the ease with which it can be manipulated, and the lesser weight of residue remaining to be handled after combustion, as contrasted with pyrites, are all distinct points of recommendation.

The suggestion has again been made during the last few months that the combustion of spent oxide leads to the formation of dust, with the consequent production of discoloured acid. Defects inherent in the design of spent oxide burners are alone responsible for this disability. It cannot be too often emphasised that if hand or mechanical burners for the combustion of spent oxide are to yield burner gases free of dust the design of the latter should embody three essential features—(*a*) Retention of heat of combustion in order to maintain as wide a disparity as possible in the relative specific gravities of the dust particles and the burner gases: (*b*) flues should be arranged for the travel of the burner gases in such a way that these are diverted at right angles at as many points as possible, thus assisting dust deposition; and (*c*) the velocity of the gases should not exceed three to four lineal feet per second.

Cupreous pyrites have not been used to the same extent as was usual in pre-war times, largely on account of returning charge considerations. Pending an adjustment of such charges it is feared that the extraction of copper from cupreous pyrites cinders must continue to prove somewhat unattractive.

A subject of some controversy[1] during the current year has been the relative merits of ammonia oxidation plants and nitre pots in the production of oxides of nitrogen for the sulphuric acid process. With pure liquor ammonia and plant of suitable design there is no reason why ammonia oxidation plants should not prove a success, and, indeed, in certain cases a source of economy. On the other hand, a properly designed potting oven with a suitable type of pot, where market or other conditions are such as to ensure a satisfactory price being realised for the nitre cake, may conceivably prove hard to beat.

The popular method of elevating circulating acid is by means of cast-iron eggs, in conjunction with which compressed air is used. The overall efficiency of this method is strikingly low, and the practical results of a glandless plunger pump which has been working in France for some time, and which has been installed at a few works in this country, are awaited with interest. If the success which the initial trials lead one sanguinely to anticipate is maintained, it is safe to say that an economy of manufacturing costs will be possible by the adoption of this pump.

There is not much calling for comment in plant or methods for the concentration of sulphuric acid. The view is generally held that the Kessler, Gilchrist, and Gaillard acid concentration towers are specially adapted for the production of 92–93 per cent. H_2SO_4, which strength may be regarded as marking the economic limit. To secure 96 per cent. acid with such plant the production is reduced materially; indeed, so striking is this that many prefer to work to the economic limit indicated, and to fortify with oleum.

Interest has been manifested in the hot air system of acid concentration,[2] as described by Mr. G. S. Gilchrist at a meeting of the American Institute of Chemical Engineers held in June last. The degree of novelty which this process possesses is a matter of opinion. The Kessler and Gaillard plants utilise hot air to a large extent as a heating medium, inasmuch as the admission of secondary air is invariably largely in excess of that which is required to effect the combustion of the producer gases. The principle of the Gilchrist process depends on blowing hot air at a temperature of about 650° C. through the acid. The plant consists of two stages resembling the saturex and plateaux of the original Kessler plant. In lieu of bubbling, arising in the Kessler plateaux, Gilchrist employs a packed tower with chequer brickwork. The consumption of oil is stated to be 35 gallons per ton of 168° Twaddel acid, when starting with 65° Twaddel acid, at air temperature. The hot air is produced by the combustion of oil in a specially designed combustion furnace, operating under pressure.

Consideration has been given to chamber plant for the simultaneous production of oleum and chamber acid.[3] The view is held in certain quarters that an oxide shaft of the Mannheim type combining accessory plant can be attached to an ordinary chamber system with advantage. In this connection it is proposed to treat the unconverted SO_2 gases (after eliminating the acid mist and suitably preheating) which emerge from the oxide shaft in a small Glover tower with nitrous vitriol, passing the exit gases to the chamber system. It has been suggested that a properly designed Mannheim contact shaft followed by absorption towers and Roller Boxes[4] affords a happy compromise between pure contact plant and the time-honoured deservedly popular chamber system. It is reported that a Roller Box installation has been working at a copper smelting works using gases from two copper converters in which 40 per cent. copper matte is blown to blister copper. Gases varying in SO_2 content

[1] CHEMICAL AGE, Vol. 6, 158, p. 826–9; Vol. 7, 165, p. 200–1; Vol. 7, 167, p. 266–8.
[2] CHEMICAL AGE, Vol. 7, 160, p. 2–3.
[3] CHEMICAL AGE, Vol. 7, 167, p. 274.
[4] CHEMICAL AGE, Vol. 7, 169, p. 344.

from 0·6 per cent. to 10·6 per cent. by volume, according to the stage of blowing, have been used in the boxes with eminently satisfactory results. Preheating of the weak gases was unnecessary.

Plant for the production of oleum in suitable quantities to be of service in conjunction with acid concentration plants, where fortification is practised, may conceivably be based on the utilisation of silica gel along with silver vanadate, or some such comparatively cheap catalytic medium. A pressure sulphur burner, the air for which has been dehydrated, would presumably constitute an initial part of such plant.

Hydrochloric Acid

The synthetic production of hydrochloric acid, by which the gases—hydrogen and chlorine—are released in the electrolysis of a solution of sodium chloride in the manufacture of caustic soda, has become increasingly popular. The combustion of hydrogen in an atmosphere of chlorine is readily effected. The gases need to be dehydrated and suitably stored and delivered to the combustion vessel under certain conditions of pressure, etc. Sarrot du Bellay has recently patented a special burner made in Vitreosil, capable of producing approximately 350 c. ft. of HCl per day.

It has been found that the brickwork, or rebated tile, flues bringing hydrochloric acid gases from the muffle of a Deacon's saltcake furnace can be advantageously replaced by oval section fireclay retorts, recessed at the ends so as to ensure a continuous jointless flue. By this means local escape is reduced to a minimum.

Nitric Acid

Both the Ostwald ammonia oxidation process and the decomposition of nitrate of soda by sulphuric acid in the usual cast-iron stills with condensing plant still continue to be employed. Pending the adoption of cheaper plant and more efficient recovery of the oxides of nitrogen resulting from the former process, the old method of manufacture is likely to continue.

It is known that 50 per cent. nitric acid represents the maximum strength that can be recovered by the tower system usually attached to the Ostwald process, except advantage is taken of an effective fractionation column, by which 65 per cent. HNO_3 can be secured without appreciable loss, and without resorting to the use of sulphuric acid. The latter represents ideal results, not as yet generally attained on a practical scale.

The future of the Häusser process[1] of direct fixation of nitrogen as nitric oxides by the explosion process has been the subject of further discussion, and whilst the ingenious character, from the technical point of view, of this process is appreciated, the view is expressed that the waste of valuable thermal energy is likely to be one of the deterring factors to the economic success of this process. To this suggestion Dr. Häusser has made a vigorous reply.[2]

Phosphoric Acid and Superphosphates

The question of producing phosphoric acid[3] by electrical methods has received some consideration by the Federal Phosphate Co. The proposal is a pretentious one, but to what extent it will succeed in displacing sulphuric acid as used in the established process it is too early yet to say.

Other proposals directed to the reduction of the use of sulphuric acid in the manufacture of calcium superphosphate have been made within the last year or so. The Plauson's colloid mill was intended to deal with phosphate rock and to reduce the quantity of sulphuric acid in the manufacture of mono-calcium phosphate, but this method cannot be regarded as a *fait accompli* at the moment. Meanwhile, combined mixing plants and excavators continue to be increasingly used in this country. The Chief Alkali Inspector intimated in the 58th annual report that there was still room for investigation in the matter of condensing methods of the gases evolved in the mixing process. A series of void chambers, fitted with high-pressure water sprays, followed by terminal towers, fairly closely packed with boards on edge, are regarded as constituting an efficient arrangement. Attention is also directed to the position and speed of the drafting fan.

[1] CHEMICAL AGE, Vol. 7, 171, 406, 14–16.
[2] CHEMICAL AGE, Vol. 7, 171, 671–2.
[3] CHEMICAL AGE, Vol. 7, 167, p. 1–2.

Evaporation of phosphoric acid by spraying the hot acid in a current of air heated to the same temperature, as invented by H. E. La Bour[1] appears to be a commendable method, possessing many advantages over the hitherto established methods of evaporation.

Synthesis of Ammonia

The success of the Claude synthetic ammonia process appears to depend on a precise geographical location, where cheap hydro-electric power is available, and where surplus coke-oven gas can be obtained, in order to admit of the securance of cheap hydrogen. The importance of the latter factor has again been urged by J. H. West,[2] who, along with Dr. Jaques, has worked out a process combining the distillation of coal in a retort, the formation of water-gas from the resulting coke, and the conversion of the carbon monoxide in these two operations into carbon dioxide and hydrogen, by reaction with steam in the presence of a catalyst. A modified form of Tully complete gasification plant has been applied for the above process. Nitrogen is usually derived via an ordinary liquid-air plant, and costs a few pence per thousand cubic feet.

The Haber process[3] is being operated on a semi-technical scale, and it is confidently expected to reach the producing stage at Billingham by the middle of next year.

The consumption of nitrogen per acre in the United Kingdom is said to be about 4½ lb. as contrasted with 10·4 lb. used in Germany. The hope is entertained that the figure of 12 lb. of pure nitrogen per acre, hitherto indicated as an attainable consumption, may be within the bounds of possibility.

Ammonia and Ammonia Compounds

As the cost of manufacture of ammonium sulphate at gas works and coke ovens will be the eventual deciding factor, from the point of view of international competition, the significance of technical efficiency cannot be too strongly or too frequently emphasised. Importance attaches to an increased yield of sulphate of ammonia per ton of coal carbonised, to the better and more economic use of steam in the sulphate process, and to the more judicious and efficient use of lime.

The thermal aspect of ammonium sulphate manufacture[4] and the directions in which economy is likely to be secured formed the subject of a paper and discussion at the Chemical Engineering Group's Conference of the Society of Chemical Industry in Glasgow in July last.

Various methods have continued to be devised for the production of neutral and dry sulphate of ammonia, and it is estimated that 50 per cent. of the current production will be of this quality.

The tendency to increase the recovery of muriate of ammonia at coke ovens is reported. There is need for a special type of evaporator of reasonably small capacity for the concentration of muriate of ammonia liquors. It is found that the physical texture and hardness of the crystals of muriate of ammonia distinctly influence the user of this product when applied for the cleansing of the zinc bath and the restoration of the mirror.

Briquetting and Sintering Processes

The Greenawalt process for the sintering of non-cupreous pyrites cinders, flue dusts, and purple ore, has been adopted at one or two works in this country recently with satisfactory results, and it is not inconceivable that this process, which is peculiarly ingenious and efficient, may replace briquetting and subsequent treatment in the tunnel kilns of the Grondal-Kjellin type.

Chlorine, Hypochlorites and Bleaching Powder

The industrial applications of chlorine appear to be growing apace, and it is not unreasonable to assume that this is attributable to its economic production, largely as a by-product of electrolytic processes. It is known that chlorine resulting from the electrolysis of common salt in the manufacture of caustic soda is being liquefied by compression, and is being sold in lead-lined cylinders and in tank wagons. It is said[5]

[1] CHEMICAL AGE, Vol. 6, 158, p. 830.
[2] CHEMICAL AGE, Vol. 7, 171, p. 414.
[3] CHEMICAL AGE, Vol. 7, 180, p. 749.
[4] CHEMICAL AGE, Vol. 7, 161, p. 47–49.
[5] CHEMICAL AGE, Vol. 6, 153, p. 652.

that electrolytic chlorine cannot be applied advantageously for the production of bleaching powder, an excessive amount of chlorine combining on contact with the lime to form calcium chloride. This is reputed to be due to the chlorine being in a *status nascendi*, and hence unusually active. By raising the temperature of the chlorine to 800° C. before absorption this difficulty is said to be overcome.

Hypochlorites have been introduced to the surgery by reason of their rapid healing properties. A very concentrated compound is produced for this purpose by treating milk of lime with chlorine, afterwards evaporating under reduced pressure with the elimination of calcium chloride by fractional crystallisation.

It is confidently anticipated that still wider applications in technical and industrial operations will be found for chlorine.

Soda and Potash Salts, etc.

One or two electrolytic plants of the Allen-Moore cell type have been erected on the Continent for the production of caustic potash from sylvine, and these plants are reported to be operating with satisfaction.

The question has been raised as to the extent, if any, of the competition of electrolytic caustic soda plants with the well-established ammonia soda process in the production of caustic soda, soda ash and sodium bicarbonate. It would appear that each of these processes has its peculiar rôle, and that they are likely to run together in much the same way as the familiar gas and electricity supply services do in this country. The use of producer gas, and even coal gas, as a medium for heating the cast-iron pots in the production of solid white caustic soda, has materially lengthened the life of these vessels.

The French *Journal Officiel* recently published a *Projet de Loi*, approving a convention agreed to by the Minister for War, with the object of developing the manufacture of sodium carbonate and caustic soda in France. *Inter alia*, the document reveals that the proximity of the three principal alkali works of France (situated near Nancy) to the German frontier led the Ministry of Armaments to investigate the question of the establishment of a state alkali works, plans of which were completed towards the end of 1918. The cessation of hostilities caused the postponement of the scheme, and subsequent financial difficulties have till now retarded action.

An alternative proposal has been found feasible by the Government coming to the assistance of La Société d'Études et Produits Chimiques—a company formed by M. Fabius Henrion—having alkali works at Mauguerre, near Bayonne, producing at the end of 1919 twenty to thirty tons of sodium carbonate only per twenty-four hours. The terms of the convention now provide, amongst other things: (*a*) For the formation of a limited liability company constituted of the original company, acting with the Minister for War and War Pensions, of three million francs capital; (*b*) for the completion and development of the Mauguerre works so as to produce 100 tons of solid soda ash (96-98 per cent.) per day, and to convert this into 75 tons of caustic soda of 72 per cent. strength; (*c*) drawings to be passed by the Service des Poudres, who are to be represented at the factory to see that the programme is carried out; (*d*) the production indicated is to be realised in two years after ratification of the convention, and is to be maintained for thirty years after that date; and (*e*) the activities of the company are to be confined to soda products.

The other provisions of the convention are mainly of a financial character.

It is hoped that, with an improvement of trade in heavy chemicals, signs of which appear in the vista beyond, not only will an opportunity be possible of consolidating the virgin ground recently covered in certain directions, but that facilities for introducing still further modifications of plant, and, indeed, new processes, will occur.

Mineral Wealth of the Dead Sea

NEGOTIATIONS are reported to be taking place regarding a concession for the exploitation of the mineral wealth of the Dead Sea. It is stated that apart from other substances, traces of calcium carbonate, and iodine have been found. Of the 34 thousand million tons of salts which the Sea is estimated to contain, it is said that about 12 thousand million tons consist of common salt and about 15 thousand million tons of magnesium chloride.

The Fertiliser Industry

ON the whole the Fertiliser Trade during the past season has been extremely disappointing, both from the manufacturers' and from the traders' point of view. Stocks purchased at the high values ruling two years ago have had to be disposed of at prices leaving little profit, and in too many cases a serious loss.

The unfavourable weather during the whole season militated against a large consumption, while the break in the value of agricultural crops caused farmers to reduce their expenditure on artificial manures. That this was a mistaken policy is undoubted, but the effect was felt throughout the trade generally.

All fertilisers were markedly cheaper than in the previous year, but this advantage was largely discounted by the above-mentioned fall in agricultural values.

Good stocks of nitrate of soda were available, and the consumption in the United Kingdom, though disappointing, was some 10,000 tons larger than in the previous year.

Sulphate of ammonia showed a slight decline in consumption, probably due to the fact that forward purchases had not been made from the mistaken belief that there would be a large fall in price in the spring. Plentiful stocks of superphosphate and potash fertilisers were to hand, but again the demand was unequal to the supply.

On the other hand, high grade basic slag was short, due to a change in the process of steel manufacture. Ground natural phosphate and Nauru phosphate are being widely tested as substitutes, and the results already obtained are encouraging.

The trade in compound fertilisers is reported to be showing signs of improvement. This may be attributed to the greater convenience of application, together with the high cost of labour and railway freights.

That the world as a whole is slowly learning the value of artificial fertilisers is certain, and in the more advanced countries they are being applied in constantly increasing quantities, due to the necessity of more intensive cultivation. This is particularly marked in Germany, where the consumption of nitrogenous fertilisers is increasing by leaps and bounds, and the United States is commencing to follow the same lines.

The outlook for the coming season is still uncertain, but though low prices for agricultural produce may rule, the necessity for increased food production is pressing; such a result can only be obtained by a largely increased use of artificial fertilisers.

W.

Spanish Chemical Trade

BEFORE the war Spain imported from abroad a great part of the chemical products employed by her industries, especially colouring matters derived from coal. From the point of view of tonnage landed in Spain, the first rank was taken by superphosphate of lime and basic Bessemer slag; then the following products may be quoted as having given rise to a good current of business: Vegetable preparations for the dyeing industry, vegetable preparations for medicinal purposes, colouring matters, sulphur (raw and refined), alkalis, insecticides, and sulphate of copper, gums, dextrine, etc., for stiffening purposes, paraffin and nitrate of soda.

Germany supplied approximately 25 to 30 per cent. of these goods; Great Britain 20 per cent.; the British possessions in Asia 12 to 15 per cent.; the Dutch colonies 6 to 7 per cent. (the two last-named regions sent principally oilseeds), while France's share of this trade amounted to between 10 and 12 per cent.

During the war the Spanish industry equipped itself to supply a considerable number of products of which the importation had ceased; for example, arrivals of coal tar dyestuffs fell from 1,351,058 kilog. in 1914 to 406,342 kilog. in 1917. This industry consequently insisted on a high customs tariff. It would appear that the commercial conventions inaugurated during the past six months will facilitate to a certain extent the importation of chemical products into Spain, but the final result cannot yet be foreseen. According to *Chemical and Metallurgical Engineering*, the Minister for War intends to buy a large piece of ground (700 hectares) in the neighbourhood of Madrid for the purpose of erecting chemical works in order to be able to manufacture products required for national defence now purchased abroad.

Chemical Engineering Progress in 1922

By J. W. Hinchley, A.R.S.M., Wh. Sc., F.I.C.

THIRTY years ago, when the writer deliberately sought to make his training the best that could be obtained for the profession of a chemical engineer, and chose metallurgy instead of chemistry as his final subject, the chemical engineer was practically unknown. Before the war even, few men called themselves chemical engineers, it was not a "paying" title. To-day, chemical engineers are in demand, and it is beginning to be realised that the logical head of most of our industries is a man whose training has been that of a "Chemical Engineer."

It must be remembered that chemical engineering is not a composite of chemistry and mechanical and civil engineering, but a study of itself, the basis of which is those operations which, in their proper sequence and co-ordination, constitute a chemical process as conducted on the industrial scale. These operations, such as grinding, extracting, roasting, evaporating, distilling, crystallizing, filtering, air-drying, separating, etc., are not the subject-matter of chemistry as such, nor of mechanical engineering. The study of these operations in a quantitive way with a correct exposition of the laws controlling them, and the design of plant to carry them out, is the province of chemical engineering. It is this emphasis on these operations in their quantitative and engineering aspects that differentiate chemical engineering from industrial chemistry, which is concerned primarily with general processes and products.

The chemical engineer must have knowledge of chemical and engineering science, skill in technique of application, and judgment in the appraisement of values and costs, realising that the "cost of production" is the controlling factor in all intelligent industry.

Signs of Progress

A few years ago, the writer was considered by some of his engineering friends and by most of his chemical friends to be a monomaniac on this subject, but to-day most of them would subscribe to his sanity. We hear less and less of the notion that greater co-operation of the engineer and chemist is required to place our chemical and other industries on a sound footing. Co-operation is obviously useless between two men, when neither understands what is wanted. Both the chemist and the engineer are beginning to realise that there is a vast amount of knowledge and experience lying outside their ambits, and any co-operation in designing plant for chemical processes can only be successful in so far as one or both of them have trained themselves in chemical engineering.

The heads of our educational institutions have become more alive to this fact during the past year, and although trade interests have compelled them to give training in trade subjects, they realise that sound scientific training in general chemical engineering is the better educational policy.

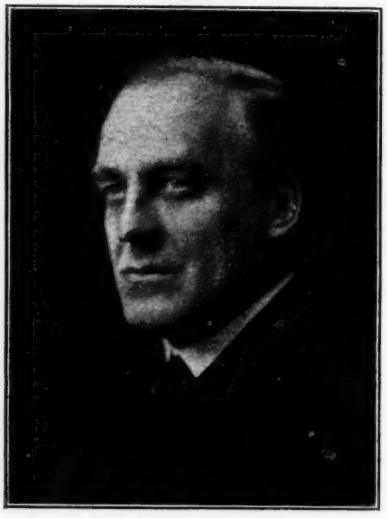
But in a still more important matter can it be stated that progress has been made. We realise more and more that the social and moral aspect of every question is more important than the question itself. These trade courses have pandered to that abominable belief that education is solely to enable a man to earn his living. In the training of the chemical engineer, the study of economics must go hand in hand with unobtrusive but definite moral training in a moral and healthy atmosphere. Games and college societies are, if anything, of greater importance than "schools." We are now realising that scientific brilliancy does not necessarily imply any competency in the art of living. We are beginning to insist on the cultivation of the art of refinement, to take pride in a fit and decent body, in pleasing speech and manners, and in tolerant and reasonable conduct which makes for a strong, sound, vigorous and healthy community.

The word "progress," in fact, usually suggests not merely growth, but mental and moral development, and it is in this sense that the year just ending has been noteworthy. We have, in fact, concluded that a mere increase of knowledge or control over natural forces does not necessarily mean progress unless the mental and moral development of men makes them capable of utilising it for the general good.

The evidence of the great war proves that the destruction of civilisation may take place readily if our organisation and mental and moral development does not keep pace with our scientific knowledge. This notion must have been in the mind of Mr. K. B. Quinan when he pointed out "that there are few chemical engineers in this or in any other country," explaining himself by stating that he "had in mind thoroughly competent men of the highest integrity and character." The new Institution of Chemical Engineers influenced, no doubt, by Mr. Quinan's views, requires from applicants for membership, references as to "personal integrity," although the definition of a chemical engineer recently suggested by the provisional committee does not include any moral phrase, but simply states that the chemical engineer is "a professional man experienced in the design, construction and operation of plant, in which materials undergo chemical or physical change."

Looking at "progress" as being a moral and mental fact, upon which material results are determined, I do not propose to discuss any changes or improvements in plant or processes which have taken place, but to mention the progress in organisation by which such changes may become permanent.

During the year the Chemical Engineering Group has been active, and has held several useful meetings and conferences. Its educational influence has been of the greatest value, but its efforts have been limited by its funds. The meetings of the Group have usually been held in association with a section or at the annual general meeting of the parent body, the Society of Chemical Industry, but a new development has been started this year and meetings are to be held regularly in London under the auspices of the Group only. Up to the present, only one meeting has taken place, but four meetings have been arranged for the rest of the session. The real work of the Group is only just beginning, and the actual value of the Group will only be appreciated after several more years' work. One



SIR ARTHUR DUCKHAM.

of the greatest difficulties to-day is the fact that the heads of many of our industrial organisations are often not able to understand or take part in the discussion of the processes and plant which they control.

The New Institution

But the most important event of the year has been the incorporation of the Institution of Chemical Engineers. Sir Arthur Duckham, K.C.B., M.I.C.E., who had been very active in urging the formation of such an institution, took the chair at the preliminary meeting, which was held on November 9, 1921, and frankly stated that "he was out to get a new kind of engineer—viz., the chemical engineer; the country needed him; our industries would fail without him." We owe a great debt to Sir Arthur for the enthusiasm and commonsense which he has put into the project. Another active worker in the formation of the Institution is Mr. W. J. U.

Woolcock, general manager of the Association of British Chemical Manufacturers. His legal mind, persuasive tongue and delightful personality have helped the provisional committee to solve the most knotty problems in organising and in bringing this movement before the chemical engineers of the country. The help given by the chemical trade papers, also, should not be forgotten.

It is now a matter of history, but there was much doubt in the minds of some as to whether the time had come to found an institution, but this doubt has completely disappeared in the course of the discussion which has taken place during the year. The provisional committee, which was elected at the preliminary meeting, set to work at once, and on February 1 placed the first draft of the Memorandum and Articles of Association into the hands of the solicitors for legal drafting. In the meantime, an appeal was made to gentlemen who were interested in the project towards the cost of bringing the Institution into being and promises of about £1,400 were received. In addition to these promises, Sir Arthur Duckham kindly offered to pay all legal expenses up to the time of incorporation. On March 8, the solicitors submitted the legal draft of the Memorandum, Articles, and Bye-Laws of the proposed Institution. This legal draft was again discussed and submitted to an advisory committee consisting of those who had subscribed to the project, and, finally, on April 5, the legal documents were approved and sent to the Board of Trade.

It was assumed that the question of incorporation would only occupy the Board of Trade for a week or two, and an inaugural dinner was held on Tuesday, May 2. At this dinner, the following resolution was proposed by Sir Frederick Nathan, seconded by Dr. Ormandy, and carried with acclamation: "That this meeting congratulates the provisional committee on having formed an Institution of Chemical Engineers along the lines indicated in the Memorandum, Articles, and Bye-Laws, and, believeing that such an Institution will be of the greatest utility, will do everything to forward its interests." Unfortuntaely, the anticipations at the inaugural dinner were not to be realised, and the solicitors reported on June 28 that the Institute of Chemistry required certain changes to be made in the Memorandum. Of these, it was at first proposed that the definition of a chemical engineer should be inserted; but, finally, on August 2, this definition was withdrawn and a clause was agreed to which would restrain the Institution from acting as a qualifying body for chemists. On September 20 it was reported that the Board of Trade were prepared to entertain the prosposal, and the documents were submitted to counsel. On October 18 the Memorandum and Articles, with amendments suggested by the Council to the Board of Trade, were brought before the provisional committee and were finally agreed to. In the meantime, the public and all the Institutions which might possibly have any interest of any kind which would be affected by the formation of the Institution of Chemical Engineers were fully informed, through the technical Press, of the progress made, and advertisements were placed at the instance of the Board of Trade in the technical Press and *The Times*, notifying the public and all concerned that incorporation had been applied for.

At the last meeting of the provisional committee on December 6 the solicitors stated that the licence would be granted in the course of a few days, and it is expected that the certificate of incorporation will be in the hands of the hon. secretary before the close of the year.

In the course of the work of the provisional committee, the American Institute of Chemical Engineers came forward and suggested close co-operation between the two Institutions, exchange of publications, and an extension of privileges of each Institution to members of the other when visiting each other's country. These suggestions were entertained by the provisional committee with gratitude.

It is interesting to note that already nearly 200 gentlemen have made application to be admitted as members or associate-members of the Institution. No attempt has been made to feel the pulse of the country with reference to the student and graduate class, but there is little doubt that the number of students and graduates which will be admitted almost at once will be very high.

The work of the Institution, of course, will be mainly concerned with these students and graduates, since it is upon them that the future character of the Institution depends. Already schemes have been put forward by which students and graduates throughout the country may be reached in a more direct manner than has been attempted by any other Institution with educational aims, and a short survey has been made of the educational position of England with reference to the subject.

Polish Chemical Industry

Pending Developments in Fertiliser Production

THE union of Upper Silesia with the Polish Republic is of importance to the development of the chemical industry in Poland. Great quantities of sulphuric acid are produced in thirteen works in Upper Silesia as a by-product from zinc blende, and this by-product serves as the basis for the production of superphosphates. A second feature of the first importance to the chemical industry in the immediate future, states the Lemberg Correspondent of the *Manchester Guardian Commercial*, is the discovery of rich deposits of phosphorite in the neighbourhood of Niezwiska, in Galicia. According to an estimate made by scientific authorities these deposits amount to over 7,000,000 tons, and are sufficient to meet the requirements of the whole country for the production of superphosphates for decades to come. The phosphorite contains little iron and alumina, and an average of about 30 per cent. of phosphoric salts. Preparatory work for its exploitation is already in progress. The increased home production of sulphuric acid and the discovery of great deposits of phosphorite will very quickly raise the fertiliser industry in Poland to importance.

Mention should be made of the production of nitrogen compounds, which serve both for agricultural purposes and for the production of explosives. The Polish Government has recently taken over the factory in Chorzow, in Silesia, formerly German State property. This is an important concern, with an annual production valued at some 30 milliards of Polish marks. Its possession makes Poland largely independent of the import of nitrates from Chile and of German synthetic saltpetre. Two years ago, moreover, the "Azot" chemical works in Bory (Galicia) were set going for the production of nitrogen salts, saltpetre and other compounds.

The increase of production of potash salts and kainit in Kalusz, in Galicia, is regarded as very satisfactory. The production in 1921 was 14,816 tons of potash salts and 9,316 tons of kainit; the corresponding figures for the first half of 1922 are 20,186 and 6,466. In the present year work was commenced for the extension of the mines in Kalusz, and preliminary work was also actively pushed forward in Stebnik, near Drohobycz, in Galicia, for the exploitation of the potash deposits there.

Soda production is represented by two large factories belonging to the Solvay concern, which produce up to 80,000 tons per annum for the home and export markets. The production of synthetic dyestuffs and coal-tar products in the Lodz district is attaining considerable importance. The four factories at work had a good deal of success at the June fair at Zagreb, in Jugoslavia, the Polish products equalling the German in quality and beating them in price.

Presentation to Sir Max Muspratt

ON Wednesday, December 20, Sir Max Muspratt, Bart., chairman of the United Alkali Co., Ltd., was entertained to dinner by representatives of the staff of the company, as an expression of their pride and pleasure in the great honour conferred upon him by the King. No fewer than 230 members of the staff attended the dinner, representing the head office at Liverpool, and the various works and offices of the company in Widnes, St. Helens, Runcorn, Glasgow, Newcastle, Bristol, London and Fleetwood. Mr. T. W. Stuart, general technical manager, presided at the dinner. Associated with Sir Max were Lady Muspratt, Miss Muspratt, Miss Vanda Muspratt and Mr. Rudolph Muspratt.

During the evening speeches were made by Mr. Stuart, Sir Max, and Lady Muspratt, and striking evidence was given of the unique personal relations existing between the chairman and all branches of the vast organisation which he controls. A suitably inscribed piece of plate was presented to Sir Max as a souvenir of the occasion.

Chemical Invention in 1922

By our Patent Correspondent

THE year 1922 has again been remarkable for a continuation of the boom in patents which commenced in 1920 and which shows no sign of abating. The confidence of the inventor in the prospect of finding a market for his inventions and his undiminished hope of the future are evidently as strong as ever, and one of the brighter aspects of a period of industrial depression is the fact that it stimulates invention and thus indirectly benefits the future course of the industry from a technical point of view.

Sulphate of Ammonia

A survey of the field of invention in the year just closed illustrates well the fact that even the most commonplace and well known of processes will repay the exercise of a little ingenuity in its improvement, for no process has received more attention than that of the manufacture of sulphate of ammonia. The need for a first-class product is evidently well appreciated, for most of the patents are for the production of a dry, non-caking, and neutral salt. There are no outstanding features in these inventions, but merely small improvements in detail, such as drying by suction, draining without cooling to avoid the formation of lumps, and numerous modifications of the known types of plant to produce efficiency and economy in working.

The Plauson Mill

Perhaps the most striking development of the year has been in connection with the colloid mill invented by Plauson, and it is already evident that there are immense possibilities in the invention. Briefly, it may be said that the function of the colloid mill is to subject materials to very intense mechanical disintegration in contact with surfaces rotating at high speed, and under heavy pressure. It is capable of disintegrating materials until their particles are no more than one hundred thousandth of a millimetre in diameter, and under such conditions many substances have the character of colloids and possess different chemical properties. As instances it may be mentioned that all kinds of oils can be converted into stable emulsions with as much as three times their volume of water, the character of the product varying with the proportion of water. Such emulsions are eminently suitable as lubricants under high temperatures owing to the high specific heat of water. Oils may also be refined in this manner, the emulsion being forced through a very fine filter which removes colouring matter, fatty acids, and salts.

The emulsifying action of the mill has a further application in the preparation of emulsions of essential oils, esters, perfumes, etc., by which the use of solvents such as alcohol is entirely eliminated. The chemical activity of substances when treated in the colloid mill is greatly intensified and many reactions which normally require long contact or high temperatures are effected without difficulty, *e.g.*, the production of a cellulose xanthogenate or viscose, and the production of cellulose nitrate or acetates. The process is also applicable to the production of colloidal solutions of metals such as silver and gold, and to the production of inks, water colour paints, etc., with much less than the usual quantity of soluble ink-base or organic dyestuff. Its usefulness extends to such processes as the purification of kaolin, and the extraction of potash from feldspar, the extraction being greatly facilitated by treatment in the colloid mill before or during chemical or electro-chemical treatment. The diverse character of these applications will indicate the wide scope of the colloid mill, and it is evident that its extension to other branches of chemistry is only a question of time. When it is appreciated that the state of subdivision of materials treated in the mill is much more minute than the size of bacteria, it will be seen that there is an immense field in the sterilisation of food products alone.

Synthesis of Organic Products

Considerable progress has been made in the synthesis of organic products and in their preparation by catalytic hydrogenation, oxidation, etc. In one process, primary butyl alcohol has been converted into butyric aldehyde by hydrogenation with the aid of a fused cupric oxide catalyst, and then oxidised to butyric acid by a catalyst such as manganese butyrate. Another process, for the hydrogenation of aldehyde to obtain the corresponding alcohol, uses a special catalyst of finely divided copper obtained by the reduction of copper formate. A continuous process for the production of alcohols and ketones which appears to have a good deal in its favour, makes use of the fact that lithium formate may be cheaply produced from the hydroxide or carbonate, and will yield methyl alcohol and acetone on heating. This avoids the difficulty that sodium and potassium formates, which are also cheaply produced, do not yield organic products on heating' while those formates which do yield organic products involve the use of the expensive formic acid in their preparation. Incidentally, it is proposed to facilitate the formation of alkali formates by leaving in the caustic alkali the precipitated calcium carbonate formed during its manufacture; the finely divided solid appears to ensure better contact of the carbon monoxide with the alkali.

A process for obtaining a high yield of formaldehyde in one operation has been patented, in which purified water-gas is passed over a catalyst of nickel and/or copper, mixed with alkali hydroxide. Another process which aims at the simplification of the synthesis of urea, obtains a mixture of ammonia and carbon dioxide by heating ammonium carbonate or carbamate, and the mixed gases are heated under pressure to obtain urea. The use of gas compressors is thus avoided, since the mixture of gases can be obtained under pressure simply by decomposition of the ammonium carbonate or carbamate. A simplified process for obtaining oxalic acid directly from wood by treatment with nitric acid involves the use of an iron compound as catalyst. Oxalic acid can be crystallised directly from the solution thus obtained, after filtering.

It will be seen that the underlying idea in most of these inventions is the simplifying and cheapening of known processes either by combining two or more steps in one, or by converting an intermittent process into a continuous one. A further example may be mentioned in the process for the continuous production of glucose from wood by treating the pulverised raw material in thin layers with liquid and gaseous hydrochloric acid.

Cellulose Products

There has been continued research in the production and use of cellulose esters and other cellulose compositions, notably in the production and spinning of artificial silk. Several patents have been taken out for overcoming the usual difficulties experienced in getting artificial silk to "take" the usual dyes. In some processes the cellulose is subjected to preliminary treatment, which avoids the necessity for "ripening" the viscose manufactured from it. Progress has also been made in the manufacture of similar plastic compositions from cellulose butyrate. A new class of ethers of carbohydrates (cellulose, starch, dextrine) has been produced by treating the raw material with methyl, ethyl, propyl, butyl or amyl chloride, a copper catalyst, and caustic alkali. There have been numerous patents for new artificial resins of the phenol-formaldehyde type, using various substitutes for phenol and formaldehyde, and various additions for modifying the properties of the product. These resins are finding increased usefulness in the arts.

Dyestuffs and Synthetic Drugs

There has been increased activity in the dyestuffs industry during the past year and many improvements of existing processes have been patented. Among these may be noted several patents relating to the alkali fusion of benzanthrone, using less alkali than usual, together with an inert solvent such as kerosene and a reducing agent such as dextrin. The production of dyestuffs of superior fastness has received attention. In one instance a blue vat dyestuff fast to chlorine and hypochlorites is obtained by the alkali fusion of β-amino-anthraquinone, starting from commercial β-amino-anthraquinone. The latter is first dissolved in concentrated sulphuric acid and then the sulphate is precipitated by adding water. All the impurities yielding products which are not fast to chlorine and hypochlorites remain in solution.

An interesting series of new acid dyestuffs and intermediate products of the benzene and naphthalene series have been

patented. These are obtained by introducing into a primary or a secondary amino group the alcoholic sulphuric acid group $R.SO_4H$, where R = alkylene. The preparation and properties of a large number of new products containing the " sulphato " group (SO_4H) have been described in the patent specifications. These include sulphato-alkylamines, azo dyes, tri-arylmethane derivatives, azine, oxazine, and thiazine dyes, etc.

Several advances have been made in the realm of synthetic drugs, principally in the direction of finding new derivatives of well-known products which avoid some of the undesirable properties of the known drugs. Some synthetic processes suitable for large scale working have been patented, such as the synthesis of thymol by sulphonation of *m*-cresol and treatment with isopropyl alcohol and concentrated sulphuric acid.

Extraction of Metals from Ores

There has been renewed activity in metallurgical chemistry, especially in the treatment of complex ores. In one process, which is applicable to many different ores, the ore is heated to redness in contact with a nitrate which is sprayed on to it, thus rendering some of the constituents more soluble; the subsequent water concentration, flotation, magnetic separation or amalgamation is thus facilitated. Another preliminary treatment of ores such as cassiterite, consists in coating the metalliferous particles with arsenic or copper by precipitation before subjecting the ore to froth-flotation. In the case of refractory metals such as zirconium, uranium, vanadium or tungsten, the ore may be reduced in the electric furnace with some metal which forms compounds which are volatile at that temperature, and are thus eliminated. A somewhat similar process applied to titanic iron ore comprises a preliminary reduction, followed by two chloridations at different temperatures, whereby the chlorides of iron and titanium are volatilised and condensed separately. Ores of tungsten, chromium, cobalt and nickel may also be chloridised by heating in chlorine or hydrochloric acid gas, and the volatile chloride either of the metal required or an impurity may thus be removed. A reduction process which is applicable to sulphide ores of lead, bismuth, silver, mercury, cobalt and iron, consists in fusing the ore with caustic soda in the presence of hydrogen.

Petroleum Products

A large class of inventions deals with tar and mineral oil products, especially plant for distilling and cracking oils, while many processes which promise good results are being worked out. In one invention low boiling hydrocarbons are obtained by hydrogenation of tar or oil in the presence of tin, and in another by partial combustion in the presence of a complex salt of titanium, vanadium, chromium, manganese, or other metal. The problem of dehydration of petroleum emulsions is solved by one inventor, by subjecting them to an electrostatic field. The waste gases from the cracking of petroleum are used in one invention, by sulphonation, followed by hydrolysis of the liquor and then distillation to obtain secondary alcohols, from which esters and ketones may be derived. A simple method of refining mineral oils consists in agitating them with phenylamine, toluidine or xylidine, which extracts all the resinous impurities as a separate layer.

General

There have been fewer inventions relating to synthetic ammonia in the past year than formerly, and those which have been patented relate mainly to the improvement of the working details of the Claude and Haber processes. Additions have been made to the long list of catalysts now available, and a process has been patented for removing the last traces of carbon oxysulphide by passing the mixture of nitrogen and hydrogen over active charcoal which has been made alkaline.

An electrolytic apparatus has been patented which employs the principle of using one electrode, either the anode or cathode, of very small surface area, so that it is raised to a high temperature by the passage of the current. A reacting gas may be introduced into the electrolyte through a passage traversing the heated electrode. This apparatus is of wide application, such as the conversion of paraffin into fats, methane into formaldehyde or formic acid, acetylene into acetaldehyde or acetic acid. Nitrogen may be fixed by passing air into an electrolyte of aluminium, magnesium, calcium, or barium chloride, through an anode of platinum or silicon, and oil may be hydrogenated or cracked.

The application of a bath of molten metal for distilling and drying operations continues to be developed, for it furnishes, perhaps, the only method of obtaining an absolutely constant temperature for the distillation of solids. It has been applied to the distillation of wood, the dehydration and distillation of tar, and for effecting fusion reactions at a constant temperature. As examples may be mentioned the production of synthetic phenol, involving the fusion of casutic soda and sodium benzene sulphonate, and the production of sodium nitrite by fusing sodium nitrate in molten lead.

Several new features in connection with the manufacture of sulphuric acid have been patented. Thus in one case, concentrated acid has been obtained directly by absorbing the compounds of sulphur dioxide and oxides of nitrogen in concentrated sulphuric acid and adding the exact amount of water to liberate the oxides of nitrogen. The usual evaporation of the dilute acid is thus avoided. In another case the Glover tower is dispensed with by an apparatus for bringing the gases containing sulphur dioxide into contact with a spray of nitrosyl sulphuric acid.

One notes the absence of any inventions during the past year connected with synthetic rubber. Improvements in the vulcanisation of rubber, balata and guttapercha are still being made, notably those depending on the successive exposure of the rubber to sulphur dioxide and sulphuretted hydrogen, and on the use of vulcanisation accelerators derived from paranitroso dimethylaniline.

The preparation of pigments continues to receive increasing attention from chemists, and the preparation of zinc oxide, lithopone, white lead, and other pigments of perfect texture and permanent colour can now be carried out with as much scientific certainty as that of any other chemical product.

British Glass Industries

Appointment of an Advisory Committee

In the course of his speech at the third annual meeting of British Glass Industries, held on December 21 at the Cannon Street Hotel, London, Sir Walrond Sinclair (chairman) said that a turn in the fortunes of the United Glass Bottle Manufacturers, Ltd., had commenced at the beginning of the present year, and that up to the end of November the production was about 1,000,000 gross of bottles, as compared with 670,000 gross for 1921, and the sales were 830,000 gross compared with 616,000 gross, and that, as compared with the loss of last year, a net profit was already assured.

With regard to the question of reorganisation, the board's anxieties had been considerably increased by the unprecedented depression of trade during the whole period that he had been in office; in fact, the difficulties of the board of British Glass Industries, Ltd., and those of the various subsidiaries, had been at times almost overwhelming, and any suggestions or proposals involving the raising of capital had been found to be practically impossible owing to the adverse conditions prevailing. The only sound foundation upon which any scheme could be considered necessary had to provide for the satisfaction of the bank overdraft and of the interest of the second debenture holders, and the obtaining of additional working capital for the company and its subsidiaries.

A scheme which, in the considered opinion of the board, was best calculated to deal with those important objects satisfactorily, had been proposed by a group of large shareholders, but, as many of the details had still to be worked out, and various negotiations in connection therewith were still in progress, he was in a position only to outline the broad principles, but the detailed particulars must, in accordance with certain underwriting letters in his possession as trustee, be circulated to the general body of shareholders at the very latest by the end of January next, when, if the scheme was approved, the shareholders would be invited to participate.

A resolution adjourning the meeting for three months, subject to an advisory committee being formed, was carried unanimously, and the following were appointed to form the advisory committee: Sir Rowland Hodge, Captain Bedworth, and Messrs. Vere H. Smith, R. N. Boustead, Howard Jones, and Rowland Allen.

Chemical Trade Movements in 1922

By W. G. W.

In my review of the trade for 1921 I stated that the way now seemed clearer than it had been for a year or more for a slowly progressive resumption of activity, and that the outlook was brighter than it had been for many months past.

This forecast has very largely proved to be substantially correct in the light of the chemical trade industry, as we now review it for the year 1922.

Business at the commencement of the year opened quietly, and buyers operated cautiously, orders in the main being for small quantities for near delivery, and this state of affairs lasted until well on into the month of April. In May signs were not wanting that the demand was steadily improving, and this was more noticeable in some of the heavy consuming industries, more especially in the textile trade. During the holiday period, the demand was maintained, and in September commenced to expand further, and this expansion has continued down to the time of writing this report.

The result has naturally been that buyers have shown a greatly increased amount of confidence in placing their orders for their forward requirements.

Manufacturers of heavy chemical products have shown their keen desire to assist industry to the full extent of their power, with the result that quotations for next year's delivery in many cases show reductions, and this should still further tend to stimulate business.

The tendency of Continental exchanges to affect the price of chemical products which were in the main imported has not been nearly so marked during the current year, and it has been noticed that even violent fluctuations in the chief Continental exchanges fails to produce more than a momentary effect on the English price. This, in our opinion, is significant and augurs well for the future, as it shows that Continental costs must now be more or less based on a stable currency, and with every rise in Continental costs against the decreasing costs in this country the outlook becomes more favourable and it is now better than has been the case for the last three years.

The position in the fine chemical industry has perhaps not been quite so favourable. Export trade to a fairly considerable extent covers the demands for fine products, and export trade has admittedly not been all that could be wished. The result has been that stocks have taken a long time to liquidate, while orders have been relatively for small quantities, and the result has been that prices have tended to still further depreciate, in some cases, to figures below the present cost of production.

Signs are not wanting, however, to show that these conditions are coming to an end, and with a broadening in the demand we should find the trade quickly coming back to the normal, as stocks are none too heavy, while, naturally, under prevailing conditions, production has been reduced to a considerable extent.

The export position is now distinctly interesting. Demand over the early months of the year was poor in the extreme, and apparently the majority of the orders passing were placed on the Continent. During the last two or three months, however, the position has entirely changed, and there is now a relatively satisfactory volume of business passing, while the inquiry at present in the market is distinctly greater than is usually the case at this period of the year. Orders are now being placed in this country by markets that have placed practically nothing for the past year or two, and it is indicative that in most cases these orders are accompanied by the proviso that shipment be made immediately, which goes to show that a number of consuming markets have left it to the last possible moment before replenishing their stocks.

A further feature now appears to be having an effect on business placed in this country, and that is finance. Only the other day the writer was travelling in Germany, and heard the case of a large order for fine chemicals that was offered to one of the leading German houses. This house was able to accept the order at a price roundly about 15 per cent. less than English competitors, but were forced to stipulate that 80 per cent. cash be paid with the placing of the order. This was not acceptable to buyers, who eventually placed their orders with an English house at the higher figure on the terms of cash against documents at port of shipment. This is significant, and proves conclusively that the policy of inflation operated by some of the Continental countries is only beneficial up to a certain point, and that in the end business is bound to revert to the country with a stable currency and one able to give normal trading credit terms.

In conclusion, it may safely be assumed that the trade is now entering upon a much more prosperous period than has been the case during the last two years or so, and the fact that quite a number of products are tending to harden in price will in all probability give a fillip to this revival.

If we consider all the difficult circumstances attendant upon the chemical industry in this country during the year under review, we must be impressed with the fact that the number of failures has been astonishingly small, and it says a great deal for the inherent stability at the back of the industry.

I cannot close my general remarks without a reference to the fact that during the current year it has seemed to me that there has been a drawing closer of manufacturers and distributors. This, to my mind, is all to the good of the industry, as, after all, the distributor plays a very important part in the commerce of this country, and now that finance is playing a much greater part in general business the interests of the producer and the distributor would appear to be much more closely allied, and quite obviously many far-seeing manufacturers have appreciated this.

In regard to legislation, the operation of the Safeguarding of Industries Act has led to a great deal of criticism, but there is no doubt that if the present poor administration were remedied a great deal of the opposition would die out. Only those who have daily experience of the working of this Act can have any idea of the vexatious and irritating delays, to say nothing of the loss of time and money, that are occasioned by the way the Act is administered.

As to the Dye-stuffs Act, although this measure has had to pass through a fierce fire of criticism, it appears that the present method of working is now giving considerably greater satisfaction, especially from the consumers' point of view.

A Detailed Review

Acetone has been a fluctuating market. Starting the year at round about £85 per ton, it declined somewhat in February and March, and subsequently declined to as low as £72 per ton in June. It suddenly advanced to £100 per ton in September, and since then has steadily increased until to-day it is practically unobtainable on the spot, and the nominal market value is round about £140 per ton. The reason for this is not far to seek. For several years subsequent to the war, war stocks were being worked off, and the increasing competition and bad state of trade reduced the price to well below the cost of production. When stocks came to an end it was realised that some months must elapse before producing plants could again be in operation, and even then the price level would have to be considerably higher. The market thereupon steadily advanced, and we close the year with a good demand and with the price firm at the above stated figure.

Acids have as usual fluctuated somewhat, and the difficulty of estimating the forward requirements has not helped the position.

Acetic opened the year at about £44 per ton for 80 per cent., and slowly advanced in February and March, while in May it declined to about £41 per ton, and this downward movement continued until September, when spot price was as far down as £39 per ton. Since then the market has very slowly recovered, until it now stands very firm at £42 per ton for 80 per cent. Throughout the year the demand has been fairly active, and this has been helped by the fact that the price has moved within comparatively narrow limits.

Citric has been a disappointing market, commencing the year at 2s. 3d. per lb., and declining in February and March to 2s. per lb., after which it advanced slightly until in June

it stood as high as 2s. 6d. per lb. It then commenced to decline steadily, and we close the year with a lifeless market without the slightest sign of demand at 1s. 9d. per lb. At this figure the product looks cheap.

FORMIC opened the year briskly at an advanced price of £60 per ton for 85 per cent. It afterwards advanced to as high as £70 per ton by the end of April. Since that date, however, it has very slowly declined, and to-day the value can be taken round about £60 per ton. Throughout the year the demand has been active, and in the main reduction of price has been due to the decline in Continental exchanges.

LACTIC has been fairly steady during the period under review, but until comparatively recently the consumptive demand left a good deal to be desired. The market opened in January at £43 per ton for the 60 per cent. by volume, and it has continued comparatively steady ever since. We close the year with the market standing a shade easier at round about £41 per ton.

OXALIC has been a fairly steady market with consumption, considering conditions, well up to the average. The value in January was round about 8d. per lb., at which figure it started to decline by infinitesimal degrees to 6½d. per lb. by the middle of November. An improvement then set in, and we close the year firm at 7¼d. per lb. Throughout the year English makers' prices have been above those of continental producers.

SALICYLIC ACID has been a very poor market throughout the year. Business opened in January round about 1s. 4d. per lb., and has continued more or less at the same figure throughout the year for the B.P. product. The demand has been much below normal and this is exemplified by the fact that although Phenol has advanced sharply during the year its advance has not been reflected in the price of Salicylic Acid. The demand for technical acid has been extremely poor and only a comparatively small amount of business has been transacted at nominal figures.

TARTARIC has been a disappointing market. It opened weak in January at round about 1s. 4d. per lb. and has continued practically featureless throughout the year. We close business with the product standing at round about 1s. 3d. per lb. with little demand.

ALUM has been a fairly satisfactory market throughout the year, and, although at times, it has been under the influence of Continental competition, the home manufacturers have maintained their position. At the start of the year, the market value was round about £18 per ton for lump, and this figure has slowly declined until it is standing to-day at round about £13 10s. per ton. Continental can be obtained for a little less, but supplies are intermittent and the consumers are therefore the more prepared to pay a little extra for the English product in order to ensure regular delivery.

ALUMINA SULPHATE has been a fairly satisfactory market, especially during the later months of the year. Home trade producers have been subjected to a considerable amount of Continental competition with the result that prices have suffered to a certain extent. The 17/18 per cent. material was quoted at round about £16 per ton at the start of the year, and under pressure of competition the market has since slowly declined, until to-day the value stands at round £11 per ton with a proportionate reduction for the lower strength. Continental producers, however, now seem to be pretty heavily sold and supplies are not so easy to obtain.

AMMONIUM SALTS have been much more satisfactory, and despite Continental competition most home trade manufacturers are able to report better business.

CARBONATE has been a quietly steady market during the current year, although at times the German competition has been severe. To-day the value may be taken at round about 4d. per lb. less 15 per cent. for lump, and the volume of business passing has an expanding tendency.

CHLORIDE has been under the influence of Continental competition during practically the whole year, and apparently it is still impossible for English makers to compete, to any considerable extent. The market opened at round about £40 per ton, and has continued to decline slowly ever since. To-day the value is round about £34 per ton at which figure it is difficult for English makers to compete.

PHOSPHATE.—This market has been fairly steady throughout the year. The market opened at round about £85 per ton, and has declined slowly until to-day's value can be taken at between £65 to £67 per ton. English makers have not been able to compete to any extent, and the trade is still mainly in the hands of the American and Belgian producers.

ARSENIC has provided its usual features. The price was standing at about £42 per ton in January, at which figure it continued relatively steady until August, when it commenced to advance. This movement continued slowly until early in October, when a further sudden sharp advance took place, and we close the year with the product standing very firm at round about £65 per ton. The demand has been exceptionally heavy, especially on American account during the last two or three months, and home production as well as that of the Continent and Japan now appears to be well sold up for three or four months ahead. At the time of writing the demand is greater than the supply, and it would, therefore, not be surprising to see still higher levels, more especially if the increased American demand holds as appears to be likely to be the case.

BARIUM SALTS have been generally in better request during the current year with bright spots here and there.

CHLORIDE opened the year at round about £14 per ton at which figure it continued firm until March, when the price still further advanced, and this movement continued until June, when as high as £21 per ton was reached. The market held firm at this figure until October, when a slight reaction set in, which has continued and we close the year with the product well held at about £18 10s. per ton.

NITRATE.—This product has been in very poor request throughout the year, although latterly there has been a welcome increase in the demand from both America and the Far East. The prices have been under the influence of Continental competition. The market during the whole of the year has been nominally round about £30 per ton, but in view of the improved demand this has slightly increased, and the product is now scarce at round about £32 per ton.

BLEACHING POWDER has been an unsatisfactory market during the major portion of the year from the home trade point of view, but, happily, English makers have been latterly able to report a much improved state of affairs and the year closes with the product in a fairly healthy condition. The market opened somewhere round about £14 per ton, which figure was reduced on two or three occasions during the year and to-day the home trade quotation is standing at £10 10s. per ton for bulk deliveries. As regards the export trade, this has been much less satisfactory. For several months the American producers were accepting ridiculous figures in order to realise some of their accumulated stocks, and these prices made it absolutely impossible for English makers to compete. The American strike, however, had the effect of immediately checking production and stocks were then rapidly moved off and this naturally had the result of putting the Americans out of the market for many weeks. A good deal of trade thereupon flowed into England and the majority of manufacturers were able to report substantial business during the closing months of the year. Just as we write we hear of a new competition from Germany, but this is not regarded seriously.

COPPER SULPHATE.—This product over the major portion of the year has been distinctly uninteresting. In January the value was standing at round about £28 per ton, with only small business passing. This price continued to be more or less maintained until the autumn, when it further declined to round about £26 per ton. Since then, however, the export demand has distinctly improved and quite a substantial volume of business has been transacted for the early months of the year. We close the year with the product standing firm at £28 per ton.

CREAM OF TARTAR.—This article has only been in fairly moderate request during most of the year. A fair amount of business was transacted in the early months round about £120 per ton, after which the figure declined to as low as £110 in April. It then continued fairly steady for two or three months, especially on export account, and we close the year with the product standing firm and in good request at round about £105 per ton for 98/100 per cent.

EPSOM SALTS have been in fairly active request considering the current state of trade although the price has declined by slow degrees. In January the technical quality was standing at round about £8 10s. per ton, and at the time of writing there is a free market at £6 per ton ex works. In regard to export,

very much lower figures have been ruling, and practically the whole of the trade has been placed in Germany. Owing to restrictions, of course, only a very small quantity of German material has found its way into this country.

FORMALDEHYDE has been a fluctuating product, and has shown some sharp movements in common with most other wood distillation materials. At the opening of the year it was quoted at £80 per ton, after which it slowly declined, until, in August, it could be obtained at as low as £68 per ton. The market then steadied until in October it started sharply to advance, and we close the year with the article standing firm and in short supply at £80 per ton.

IRON SULPHATE has only been moderately active, and while the price has been mainly steady, with any considerable business, lower prices could be obtained. The average value to-day is round about £3 per ton at works in barrels. Quite a considerable amount was shipped to Germany during the autumn months which is significant, and as we close evidence is not lacking that the demand is slowly broadening on both home and export accounts.

LEAD SALTS, have in the main, been quietly steady with relatively small price fluctuations.

ACETATE.—This article has, in the main, been under the influence of German competition, but the volume of business transacted can be considered relatively satisfactory. Commencing the year at round about £45 per ton, the article slowly declined, until, in the autumn, it reached the figure of £36 per ton, and since that date it has firmed up slowly, so that we close the year with the product well held at £39 per ton. It is satisfactory to note that home trade producers seem again able to enter into competition.

NITRATE has been a disappointing product. Trade has been on the small side on both home and export account, and the majority of the export business has been placed on the continent. The market has slowly declined from £48 per ton at the opening of the year, and to-day is standing firm with a hardening tendency at £42 per ton.

LITHOPONE.—Business in this product has not been satisfactory, and the demand still seems to be at any rate, as far as home trade is concerned, well below the normal. In January the price was standing at round about £23 per ton, and by very slow degrees it has declined, and we close at £21 per ton for 30 per cent. light resisting. It is thought that if there is any immediate revival in trade the price will advance quickly.

POTASSIUM SALTS in the main have been in moderate demand, although here and there there have been bright spots. Generally speaking, what movements there have been have been in the downward direction.

BICHROMATE.—The consumption of this article has been below the normal and all price movements have been in the downward direction. In January the market was standing steady at 7½d. per lb., at which figure it stood firm until May, when the price was reduced to 6¾d. per lb. In October this was further reduced to 6¼d., and we close the year with the product standing firm at 6d. per lb. At one period there was a certain amount of importation from America, but at the English makers' prices. This is not now possible and, indeed, at current quotations exportation of the British product has recently increased.

CARBONATE.—The value of this product has moved within narrow limits. Throughout the year demand has been well below the normal, although during the last month or so a slight increase in the demand can be detected. In January the price was standing at round about £30 per ton on the basis of 80 per cent., while we close at the figure of £25 per ton, and this price cannot be considered excessive in view of the pre-war value. Buyers confined their orders to near requirements, while stocks are also very light.

CAUSTIC has been a disappointing product and trade is still very considerably below normal. The market has been in buyers' favour continuously while the market value has declined slowly from round about £34 per ton to the present quotation of £27 per ton.

CHLORIDE has been an article in slightly better request and is quoted at about £15 per ton.

PERMANGANATE has been more interesting, although orders, as could only be expected, have been in the main for relatively small quantities, and taken as a whole the demand is still well below normal. In January the value was standing at 1s. per lb. and then slowly declined to 9d. per lb., at which figure it was quoted in August. In November a further cut took place and business was done at as low as 6¾d. per lb. During the closing weeks of the year there has been a sharp revival and the market closes firm at 8½d. per lb., with the material in good request.

SODIUM products have enjoyed generally much better business than was the case in the preceding year, and it is satisfactory to note that on the whole the demand for English materials has sensibly increased and that with one or two unimportant exceptions manufacturers to-day are well holding their own.

ACETATE, relatively speaking, has varied very little, although most of the trade has been done in Continental material. The market opened brickly at £25 per ton and then fell off somewhat until it could be secured at as low as £21 per ton. During the closing months of the year the demand has increased and the market closes very firm at £24 per ton, with the material in short supply. A feature recently has been the great increase in the demands on export account, especially for some of the Colonial markets.

ARSENIATES have been relatively uninteresting and the prices have in the main followed those ruling for arsenic. After being weak, the value has recovered and is now standing firm at £45 per ton for the 45 per cent. material.

BICARBONATE has been reduced in price on one or two occasions, while next year's figures show a further small reduction for the mineral water quality.

BICHROMATE has been in fairly moderate request during the majority of the year, while the demand has materially improved during the closing months. In January the makers' quotation was 6d. per lb., which has been reduced on two or three occasions, until it stands to-day at the figure of 4½d. per lb. At one time a considerable quantity of American material was imported, but the latest reduction in the English makers' price has enabled them to easily keep pace with this competition, and as we go to press an advance is reported in the American quotation, which means that to-day the trade is easily held by the English manufacturers.

BISULPHITE.—This article has been in good request throughout the year, and it is extremely satisfactory to record that at no time have the English manufacturers been seriously troubled by foreign competition. They have reduced quotations on several occasions immediately it was possible to do so. Commencing the year at £22 per ton, it is quoted to-day at £20 per ton for white powdered, and most manufacturers are well occupied with business. Far Eastern consumers especially have found that the English product is more reliable than some of the Continental, and therefore Continental competition is not greatly feared.

CHLORATE has been only in poor request throughout the year, and has varied very little. From the starting market value of round about 3d. per lb., it is quoted to-day at 2½d. per lb. Until the textile demand increases, little improvement can be looked for.

CAUSTIC has been an active feature during most of the year, and business has not suffered in violent fluctuations as in the majority of other chemical products. Commencing the year at round about £24 per ton, the price has slowly declined until it stands to-day at £20 per ton for 72 per cent. American competition was prominent in certain export markets until the strike, and there are signs that it is again becoming evident. Manufacturers, however, are comparatively well sold, and with the general improvement in the home trade demand, business for the New Year should be satisfactory.

HYPOSULPHITE has not been a very exhilarating market from the home manufacturers' point of view, although during the latter months business has been decidedly better. Competition from Germany has been rather acute, but with the latest reduction in the home trade manufacturers' prices there is now very little in it, and it should be worth the buyers' while to keep to the home trade product. Commercial was quoted at £14 10s. per ton in January, and has declined by slowly successive stages to the new price for next year of £10 10s. per ton for bulk deliveries at which figure substantial business has been transacted. A more pleasing feature is that recently a greatly increased volume of business has been placed on export account. As regards the photographic quality, trade has been fairly satisfactory, taking it all round. Business commenced at £19 per ton for pea crystals, and is to-day firm at £15 per ton.

NITRITE.—Trade in this product has been poor, mainly owing to the general stagnation in the dye-stuff industry. Orders have in the main been for small quantities only, and only during the last two months of the year has there been anything like a moderate amount of activity in the demand. Price has been fairly level, and following the general trend of heavy chemical products values have slowly declined during the year. In January it was quoted at £36 per ton, and we close with a firm market at £29 per ton. Mainly owing to a Continental strike, stocks are rather light.

PHOSPHATE has also been until recently an unsatisfactory product. It has declined in value from £18 per ton to £15 per ton, but recently the demand has improved, and the closing market may be taken at a slightly higher figure than the one mentioned. Very little material of English manufacture has been sold, and the majority has been of Continental make.

PRUSSIATE has been a bright spot with an active demand throughout the year, more especially on export account. In January it was practically unobtainable for near delivery, although the nominal market quotation was 9d. per lb. From this figure the price slowly advanced to 11d. per lb. in April, at which figure it was well held for some months. During the last two months of the year, however, the demand has perhaps been not quite so active as very frequently occurs with this article during the closing period of the year. As we close, the market stands firm at 10d. per lb. for early delivery.

SULPHIDE.—There has been very keen competition in this product, and, with the depression in the main consuming industries using the article, trade has not been all that might be desired. The market has followed the normal course of other heavy chemical products, and declined by successive degrees from £24 per ton to £17 per ton for concentrated, and from £14 per ton to £10 10s. per ton for crystals. As we close, the demand on home trade account is much brighter, and producers are anticipating greatly increased output for next year. Business on export account has also been unsatisfactory, and has been under influence of Belgian and German competition. The margin between the two figures, however, to-day is infinitesimal, and therefore better business on this side is also to be anticipated.

SULPHITE has been quietly steady throughout the year, and values have moved very little. From the starting value of £13 per ton, the figure has dropped by small amounts to to-day's level of £11 10s. per ton at works, while photographic is standing at £19 per ton.

TIN SALTS have been a small market, and business has been uninteresting.

ZINC SALTS have, especially during the closing months of the year, been much more satisfactory, and prices have advanced.

CHLORIDE.—After being in very poor request during the major portion of the year, this product has been brighter recently. The value of the solid has declined from about £30 per ton to about £25 per ton, at which figure there is quite an active demand on export account.

SULPHATE has been also in better request, and the price has kept within fairly narrow limits. From an opening value of £18 per ton to-day's figure be taken at round about £16, with a relatively satisfactory business to report.

Institution of Chemical Engineers

THE Institution of Chemical Engineers (the word "Limited" omitted by licence of the Board of Trade) was registered on December 21 as a company limited by guarantee without share capital. The objects are: To promote the science and practice of chemical engineering, to improve the standards and methods of education therein, etc. The management is vested in a council, the first members of which are: Sir Arthur M. Duckham, K.C.B., 52, Grosvenor Gardens, S.W.1, engineer; J. A. Reavell, 5, Grosvenor Gardens, S.W.1, chemical engineer; J. W. Hinchley, 55, Redcliffe Road, S.W., professor of chemical engineering; W. Macnab, 10, Cromwell Crescent, S.W., consulting chemist; H. Talbot, 24, Buckingham Street, W.C.2, chemical engineer; C. S. Garland, M.P., 57, Garratt Lane, S.W.18, chemical engineer; F. H. Rogers, 181, Queen Victoria Street, E.C.4, consulting chemical engineer. The registered office is at 166, Piccadilly, W.1. The file number is 186,603.

British Broken Hill Offer

Formation of a New Company in Australia

THE details of the offer made to purchase the shares of the British Broken Hill Proprietary Co. are now available. The directors were approached by Messrs. E. L. and C. Baillieu for the acquisition of all the shares with a view to the formation in Australia of a new company to acquire in the first place the shares of the British Broken Hill Co. and ultimately to acquire or to control its assets and business. The offer made gives each shareholder the choice of three courses—(*a*) 15s. per share in cash and 20s. in a share of £1 fully-paid allotted or transferred free of cost in the new company; (*b*) the whole £1 15s. per share in cash; and (*c*) £1 15s. per share in cash in respect of part and 15s. per share and a fully-paid share in the new company for the remainder of the shares held by a shareholder.

The directors themselves have already accepted the offer, and they recommend other shareholders to do so. Messrs. Baillieu have a right to rescind all agreements for sale if the offers are not accepted as to 75 per cent. of the shares of the company before January 15, but there can be no partial rescission.

The new company is already incorporated in South Australia as the British Australian Broken Hill, Ltd., with a nominal capital of £750,000, divided into 750,000 shares of £1 each ranking equally. The head office of the new company is in Adelaide, and it will have a branch office and branch register in London. Application will, in due course, be made to the London Stock Exchange for a settlement in or quotation of the new company's shares. Mr. David John Gordon, Mr. Gerald H. Robinson, Mr. Maurice Howard Baillieu, and Mr. George Henry Prosser are the directors in Adelaide of the new company. Messrs. Baillieu are underwriting 525,000 shares in the capital of the new company (of which 150,000 are taken firm) at a commission of 6d. per share.

Sulphide Corporation Prospects

PRESIDING on December 21 at the 26th annual meeting of the Sulphide Corporation, Ltd., the Earl of Kintore said that during the past year the prices of metals had been well maintained, but some modification of the Edmunds award was so obviously desirable that he had hopes that before long its terms would be reviewed and a more elastic scale arrived at.

Their total production of crude ore from the Central Mine last year was 120,603 tons, which compared with a production of 62,419 tons during the seven working months of the preceding year. As to costs, he was glad to say that during the year under review there had been a slight reduction from the very high figures of 1921, their lead concentrates having cost them last year £11 15s. 10d., against £12 9s. 5d. in the previous year.

Regarding their English Zinc Works at Seaton Carew, no work at all was possible during the first part of the past year owing to the coal strike, but in the second half-year they were able to run on a four-furnace basis which enabled them to produce about 1,000 tons of spelter from their distilling furnace.

As to the current year's prospects the chairman observed that they had practically half of their current financial year already behind them, but he could confidently say that if the results of the second half-year were equally satisfactory they should show next year considerably higher profits than they had been able to show this year.

American Fertiliser Manufacturing Proposals

A FEDERAL plant at Muscle Shoals, Ala., for the manufacture of nitrate and fertilisers is proposed in a Bill introduced to the American legislature by Representative Dickinson of Iowa. The Bill provides for the organisation of the Federal Chemical Corporation, comprising the Secretary of War, Secretary of Agriculture and three members to be appointed by the President. By the terms of the Bill one of the nitrate plants would be remodelled to manufacture explosives and fertilisers, and the other would be used solely for the production of fertiliser to be sold to consumers directly or through agencies in various parts of the country. The corporation would also be authorised to fix prices for fertilisers charged by private manufacturers who obtained the crude materials from the Muscle Shoals plant.

Chemical and Allied Societies

Notes on Their Work During 1922

British Association: Chemistry Section

If it cannot be said that this year's meetings of the British Association produced anything of a startling or revolutionary nature so far as the Chemistry Section is concerned, it can truly be claimed that the meetings were of a most interesting character, and the papers showed many evidences of much solid work in various branches of the science, both pure and applied. The President of the Section (Principal J. C. Irvine, D.Sc., F.R.S.) dealt in his address with the "Organisation of Research" and with "Some Research Problems in the Carbohydrates." He stated that in his judgment there should be a Board or Standing Committee in every University or Research Institution, entrusted with the supervision of research. This Committee would (*inter alia*) allocate the monies voted for research expenses, and have power to recommend promotions in and additions to the staffs of research departments; would create libraries, and provide grants for the publication of the work carried out. Such a Board would avoid calling for annual lists of publications from the research laboratories, owing to the risk of injuring the true research atmosphere by a feeling of pressure to publish, or alternatively of being discredited. The second part of this address consisted of a most luminous review of the work done by the President himself and his co-workers in connection with the chemistry and constitution of the polysaccharides. These researches have thrown much needed light on the constitutions of cellulose, starch, synthetic dextrins and inulin. A new development in the chemistry of polysaccharides, revealing a most promising line of attack for the final elucidation of their intimate constitution, has thus been inaugurated, and references to the details of these researches have already appeared in the columns of The Chemical Age. Emanating from the same laboratories, papers were read (1) by Dr. H. S. Gilchrist on the "Constitution of Synthetic Fats containing a Carbohydrate Chain," in which it was shown that *a*-methyl-glucoside and mannitol both combine, on heating in the presence of sodium ethoxide, with the oleyl residues of olive oil, glycerol being liberated; in the first case a mono-oleate is initially formed, while in the second two oleyl- groups enter the hexitol chain, the carbohydrate chain losing one molecule of water in each case, the fatty residues remaining intact; complete structural formulæ were assigned to the original "methylglucoside" and "mannitol" fats; (2) by J. Pryde on "A new Type of Nitrogenous Sugar Derivative," in which a description was given of the conversion of a carbohydrate into a derivative in which nitrogen is present in a stable cyclic compound, by the application of Weerman's method of degrading hexoses to pentoses by the action of sodium hypochlorite on the amides of simple hexonic acids, in this case prepared from a fully methylated hexose. A body having the constitution of an internal urethane was isolated, showing the stabilising effect of the methyl group in the sugar chain; and (3) by Dr. E. L. Hirst, whose work on "Esparto Cellulose" showed that this substance is, to the extent of at least 90 per cent., a definite chemical compound composed of glucose and xylose residues present together in the proportions of 80 and 20 per cent. respectively.

An absorbing and comprehensive address by Professor Sir W. H. Bragg on the "Crystalline Structure of Organic Compounds" was made interesting to all present, because the speaker dealt with his subject in chronological order and refrained from going too deeply into the more intricate channels of this newer line of research. The spacing of the atoms in the lattice-work structure of the crystals of many compounds was clearly demonstrated.

Perhaps the most generally interesting of the discussions engaged in by the Section was that on "Photo-Synthesis"—when the botanists joined the chemists. Those taking part included Dr. Blackman, Professors Baly and Heilbron, and Messrs. Briggs and Hollins. Notable progress in this fascinating field was registered by the speakers during this memorable afternoon, particularly by the Liverpool school of workers. Professor Baly pointed out that in all chemical reactions it is necessary to supply energy to the molecules to cause them to react, and in highly endothermic reactions this energy is often necessarily supplied in the form of light. The most interesting of such reactions is the conversion of carbon dioxide into formaldehyde, as it marks the first step in the formation of sugars, starches and celluloses, and plays a fundamental rôle also in the synthesis of the nitrogenous products of plant life. There is little doubt that in the plant the reaction proceeds in three stages:

1. Chlorophyll A + H_2CO_3 + light = Chlorophyll B + formaldehyde.
2. Chlorophyll B + Carotin = Chlorophyll A + Xanthophyll.
3. Xanthophyll + light = Carotin + Oxygen.

(The two chlorophylls, carotin and xanthophyll are closely-related plant pigments.) The newly-synthesised formaldehyde, best expressed by the formula CHOH, is markedly reactive, and in presence of potassium nitrite, known to be a constituent of the growing leaf, formhydroxamic acid is produced. This substance reacts with formaldehyde to form *a*-amino-acids, and nitrogen bases such as glyoxaline, pyridine, pyrrole, quinoline, and indole. Substituted amino-acids are readily produced from these, which are in a highly reactive state, and condensation then occurs with production of proteins. Those nitrogen bases which do not condense with amino-acids undergo further condensation to form alkaloids, which have already been obtained in various experiments. Polymerisation of the excess of the formaldehyde produced in the photo-synthesis gives rise to hexoses, and so, finally, to sucrose, starches and celluloses. The more complex plant compounds are predominantly multiples of a C_5 unit in constitution, as, for example, terpenes ($C_5 \times 2$), sesquiterpenes ($C_5 \times 3$), etc. Drs. Heilbron and Hollins have therefore suggested that this 5-carbon unit is formed by the oxidation of ω-hydroxy-methyl furfuraldehyde, derived from hexose by loss of water. If furane derivatives are formed in this way, then condensation of these into pyrroles by ammonia or methylamine can readily be understood.

Other papers of interest to specialists were on the "Study of Soap Solutions," by Professor McBain, and "Atmospheric Dust," by Dr. J. S. Owens.

The final meetings of the Section were devoted to discussions of the scientific and industrial aspects of fat-hydrogenation, introduced by Dr. E. F. Armstrong and Mr. E. R. Bolton; and of questions relating to the nitrogen and nitrogen-fixation industries, by Drs. Harker and Maxted, and others. These papers and discussions were of the highest importance, but it is not necessary to go into details in the present review, as our columns have already dealt with these matters at some length. The afternoons were mainly taken up by most enjoyable outings to works in the district, when the members had the opportunity of seeing the latest methods employed in the manufacture of cement, edible oils, feeding cakes and margarine, and of witnessing various metallurgical operations.

A. R. T.

The Federal Council

The Federal Council for Pure and Applied Chemistry is in its infancy. So far it has had two duties to carry out: (1) to co-ordinate or help to co-ordinate the activities of the many chemical societies of the country; (2) to act as the representative of Great Britain in the Union Internationale de la Chimie Pure et Appliquée.

There are now on the Federal Council representatives from eighteen societies and one or two co-opted members. During the last two years the Council has been very glad to assist in the formation of a joint committee of members of the Chemical Society and the Society of Chemical Industry, to consider the feasibility of a weekly journal to deal with both Pure and Applied Chemistry. This committee took a good deal of trouble to explore the possibilities, consider the financial risks to be run and the advantages which might be expected to accrue to the science and industry. The Society of Chemical Industry has undertaken the financial risk, and the Chemical Society has offered that co-operation without which the venture could not be a real success. The first number of the new journal will appear on January 5, 1923.

The Council has been in the past much hampered by the lack of an adequate income and has within the last few days issued an appeal for funds. Already upwards of a thousand pounds has been promised in small subscriptions from £50 down to one guinea. When a really substantial endowment has been obtained the Federal Council hope that the income will enable them to increase the volume of propaganda and co-ordination which they have yet to do.

The Union Internationale has for three years been organised and run by our French colleagues; they have done this work admirably and laid down a well planned and solid foundation. Now for the next three years the President will be Sir William Pope and the offices of the Union will be in Paris. The burden of carrying on the work of the Union will in this manner largely fall upon Great Britain and France. It is felt that the Union is now sufficiently well established to undertake the discussion of important chemical topics at its next few meetings and the dissemination of valuable information.

STEPHEN MIALL.

The Institute of Chemistry

THE roll of membership of the Institute has been substantially increased (by about 300 members), and the number of entries for the examinations has shown a marked advance.

The subjects which have occupied the attention of the Council, in addition to the normal business of the Institute, include: laboratory glassware and porcelain and fine chemicals; the title "chemist"; the interests of Government and other official chemists and of teachers of chemistry; the relations of manufacturers to their chemists; income tax; and the interference of agricultural colleges with professional work.

The local sections, whereby much is being done to promote the social interests of the profession, have shown marked activity; several have held joint meetings with the Society of Chemical Industry and other bodies, and nearly all have been visited by officers from headquarters. A Students' Association has been formed under the auspices of the London Section, and is making good progress.

The scheme of examinations for national certificates in chemistry, which is intended to take the place of that under the old Science and Art Department, and in which the Institute is co-operating with the Board of Education, has been duly inaugurated. The pass lists for the first examinations were somewhat disappointing, but with the experience gained and a larger number of institutions entering candidates, there is good reason to hope for better results in 1923 and that the scheme will exercise considerable influence on the teaching of chemistry in technical colleges in England and Wales.

The Appointments Register has again been of much service both to chemists and to employers; but, owing to the increased output of graduates from the universities, and to the continued depression in commerce, there is at present a surplus—representing about 3 per cent. of the membership—of chemists who are looking hopefully to the New Year for the return of more active industrial conditions which should enable them to obtain appointments.

The Meldola Medal was awarded to Dr. C. K. Ingold.

The Society of Chemical Industry

DURING the past year the Society has suffered, as other societies have done, through loss of members due to unemployment. Many young chemists and even older men with much experience have, on this account, found it necessary to curtail their expenditure, and the payment of subscriptions has become difficult and, in many cases, impossible. We have the assurance, however, that in the great majority of cases those who have left the Society have done so with the full intention of rejoining it as soon as circumstances permit them to do so. The Council has made a special concession to those who have been unable to pay their subscriptions to renew their membership within a certain specified period without paying up the arrears, and it is to be hoped that this will be taken advantage of if and when conditions in the industrial world improve.

Extensive propaganda has been carried on overseas, especially in Canada, United States, India, China, and Japan. The interests of the Society in Canada have been greatly helped by the valuable work done by Professor Ruttan of Montreal, last year's President. He has visited all the Sections, and by his enthusiasm has done a great deal to consolidate the work of the Sections in the Dominion and to bind them more closely to the membership at home.

The membership in the United States has been well maintained, and in fact slightly increased. We were assured, on the occasion of the Society's visit to New York last year, that the Journal was greatly appreciated there on account of its international character, a feature which is essentially and peculiarly its own. This view of the Journal is also held and expressed by members in other parts of the world.

The possibilities of forming Local Sections in India, China, and Japan are being investigated, and in the process there is gratifying evidence forthcoming of the interest which our members in these countries have in the work of the Society.

The Council, after long and careful consideration, has decided that in the interests of the members it is important that the Journal should be produced more frequently than it is at present, and from January 1923, it will be published once a week. The first issue will appear on the 5th proximo.

Financially the Society is in a very healthy condition, and it has been possible, during the year, to make an addition to the invested funds, leaving out of account the Messel Fund which has been substantially increased by investment of income.

One of the features of the present year was the annual general meeting held in Glasgow. The view of those who attended that meeting is that it was one of the most successful annual meetings that the Society has ever held in this country. Advantage is being taken of the International gathering of chemists in Cambridge in June next, to hold the Society's annual meeting there, in the hope that delegates attending the former will remain to take part in the functions arranged by the Society.

J. P. L.

The Chemical Society

THE Chemical Society was founded in 1841 and received its Royal Charter in 1848. The object of the Society, as laid down in the charter, is the general advancement of chemical science by the discussion and publication of new discoveries, and the interchange of valuable information respecting them. Under the terms of the supplemental charter granted in 1920, the membership consists of fellows and honorary fellows. Fellowship is open to members of either sex. Every candidate for election as a fellow must be proposed according to a form of recommendation subscribed by not less than three fellows of the Society to whom he is personally known. In the case of a candidate resident abroad who is unable to obtain three signatures, the council has the power to accept a certificate signed by one fellow of the Society. The admission fee is £3, and the annual subscription £3. The total membership now exceeds 4,000.

The affairs of the Society are conducted by a council, elected by fellows from their own body, consisting of the president, not more than twelve vice-presidents, the treasurer, secretaries, and eighteen ordinary members of council.

Ordinary scientific meetings are held, as a rule, twice a month from October to June. At the meetings, papers are read and discussed and lectures delivered by men eminent in chemistry and the allied sciences. The Society publishes a monthly journal, consisting of original memoirs communicated to the Society, and of abstracts of papers bearing on chemistry appearing in recent British and foreign journals. The annual reports dealing with the recent progress of chemistry in its various aspects are published in March of each year. The Society possesses a library of some 28,000 volumes, which may be borrowed under certain regulations.

The present officers of the Society are: President, Sir James Walker, D.Sc., F.R.S.; treasurer, Jocelyn F. Thorpe, C.B.E., D.Sc., F.R.S.; secretaries, James C. Philip, O.B.E., D.Sc., F.R.S., and J. I. O. Masson, M.B.E., D.Sc.; foreign secretary, A. W. Crossley, C.M.G., C.B.E., F.R.S.; assistant secretary, S. E. Carr, F.C.I.S.; librarian, F. W. Clifford.

S. E. C.

The Faraday Society

THE Society has continued to make a feature of joint meetings with other societies to discuss the physico-chemical bases of processes or industries with which the latter are specially concerned. During the year under review two joint meetings

of this kind were held. On March 9 and at an adjourned meeting on March 23 the Society met jointly with the Oil and Colour Chemists' Association to discuss certain properties of powders and, more particularly, *The Grading of Powders by Elutriation*. In addition to papers of a purely scientific character the discussion covered applications in the paint industry, the optical industry, certain food preparation processes and geological applications.

The other joint meeting was held on October 16 in conjunction with the British Cold Storage and Ice Association, and the subject discussed was the *Generation and Utilisation of Cold*. The subject was treated under two headings. (I) Laboratory Methods of Liquefaction and the Measurement of Low Temperatures. Important papers were contributed by Prof. H. Kamerlingh Onnes and Dr. C. A. Crommelin describing the present equipment of the great cyrogenic laboratory at Leyden, and giving an account of recent experimental work, in the course of which a temperature of nearly $\frac{1}{3}^{\circ}$ below 1° absolute was attained. (II) Industrial Methods of Liquefaction and Practical Applications of Low Temperatures. This section included: A review of present industrial methods of liquefying air and separating its constituents, by Mr. K. S. Murray; applications of liquid oxygen in aircraft practice, by Dr. E. A. Griffiths; and the manufacture of hydrogen from water gas and coke oven gas, by Monsieur G. Claude.

In addition to these special meetings the Society held three ordinary meetings for the reception of papers on various branches of physical chemistry and its applications.

It has recently been decided to publish the Transactions four times a year, in February, May, October and December, so as to expedite publication of original work. In addition to the Transactions the Society publishes separate reprints of reports of General Discussions.

The programme for 1923 includes a General Discussion on the *Physical Chemistry of the Photographic Plate*, to be held on May 28, when Professor Bancroft, of Ithaca, U.S.A., will deliver the introductory address, and a joint meeting with the Sheffield Section of the Institute of Metals on February 9 at which the properties and uses of some of the new non-corrodible alloys will be described and discussed. Later in the year a joint meeting with the Manchester Metallurgical Society will probably be held.

Sir Robert Robertson, K.B.E., F.R.S., is now President of the Society. Professor F. G. Donnan, F.R.S., Vice-President, has been appointed one of the four English members of the Editorial Board of the Journal of Physical Chemistry.

Full particulars of the Society may be obtained from the Secretary and Editor, at 10, Essex Street, Strand, W.C.2.

F. S. S.

Association of British Chemical Manufacturers

THE Association of British Chemical Manufacturers, 166, Piccadilly, London, W.1, may be described as the recognised representative organisation of British Chemical Industry. The capital invested in the 150 firms who are members is over £100,000,000. The Association is divided into twelve groups, representing manufacturers of acids; alkalies; fats, soaps, etc.; paints, varnishes, etc.; coal tar primary products; fine chemicals; phosphorus, manganese nickel, etc.; cellulose, celluloid, etc.; explosives, dyes and intermediates; refractory materials; ammonia products; and allied industries. The principal objects of the Association are:—

(1) To promote co-operation between British subjects engaged as manufacturers in the chemical or closely allied industries.

(2) To place before the Government and Government Officials and others, either in the British Dominions or elsewhere, the views of members of the Association and others upon matters affecting chemical industry.

(3) To develop technical organisation, to promote industrial research, industrial efficiency, and the advancement of applied chemistry.

(4) To keep in touch with the progress made in chemical knowledge and practice and to facilitate the development of new British industries and the extension of existing ones.

(5) To improve the methods of education in chemistry and its allied subjects so that the methods shall be better adapted to the practical necessities of chemical industry and to encourage the sympathetic association of members of the Association and others engaged in the chemical industry with the various Universities and Technical Colleges, either in the British Dominions or elsewhere, and to arrange conferences between manufacturers and teachers.

(6) To act as arbitrator or to appoint arbitrators to act in the settlement of disputes arising out of transactions in or relating to the chemical industry.

The officers of the Association are:—Hon. President, Mr. Robert Grosvenor Perry, C.B.E.; Hon. Vice-President, Sir John Brunner, Bart.; Chairman, Sir Max Muspratt, Bart.; Vice-Chairman, Sir William Pearce; Hon. Treasurer, Mr. C. A. Hill, B.Sc., F.I.C.; General Manager, Mr. W. J. U. Woolcock, C.B.E., F.C.S.

It is generally recognised that during the past year the chemical trade as a whole has passed through one of the most difficult periods in its history. The storm, however, has been safely weathered and the coming year should see a marked improvement in all directions.

The Association of British Chemical Manufacturers has in no small degree assisted manufacturers to tide over this difficult period.

Reduction in railway charges, amendment of Home Office Regulations in connection with dangerous and unhealthy industries, and reduction in the proposed increased fees charged by the Ministry of Health for registration under the Alkali Works Registration Act, have been obtained for the industry through the intervention of the Association.

Chemical industry, for the first time in its history, had a thoroughly comprehensive exhibit at the British Industries Fair in February and March; this resulted in orders being placed with exhibitors and, what was even more valuable, demonstrated the position in which chemical industry stands to the other great industries of the country. The publications of the Association during the year include an official directory printed in six languages, the Association's "Who's Who," pamphlets describing the aims and activities of the Association, and lists of British research and fine chemicals produced by members of the Association. Perhaps the most widely read and discussed pamphlet issued by the Association was the one entitled, "Shall the State Throw Away the Keys," which, preceded by a Foreword by Sir William Pope, sets forth all the many and various reasons why it is essential that a fine chemical industry should be built up and maintained in this country.

Co-operation between this Association and the British Chemical Plant Manufacturers' Association has resulted in the publication of the Report on the Standardisation of Steam Jacketted Pans, which specification has been adopted by the British Engineering Standards Association as the official British Standard. Final reports on standard covers for jacketted pans and standardisation of cast iron filter presses will shortly be issued, and will, it is hoped, be adopted as the official standard specifications.

Much has also been done in developing and increasing the manufacture of dyestuffs in this country; this has entailed a great deal of time and hard work on the part of all concerned, particularly of the Licensing and Development Committees, but the ends already achieved amply repay the time and thought expended. The success attained may be measured by the improved quality of the dyes now being made and by the increase in the number of colours now being manufactured. The outlook for the New Year is much brighter and there is a feeling of restrained optimism in the industry. Provided the situation on the Continent does not take an unexpected course the report to be written 12 months hence should be much more favourable than the present one.

Chemical Industry Club

SINCE its inception some six or seven years ago, and particularly since it began to occupy its present premises at 2, Whitehall Court, the Chemical Industry Club has made great advances. Perhaps the most important fact connected with the progress of the Club is that it is now accepted as an important and essential portion of the industry and profession of chemistry in England. From year to year at the annual dinners, the fourth of which was held a few weeks ago, the tone of the speeches has shown that the Club is an established and recognised fact. At first, even after it was housed at Whitehall Court, the attendance at the Club was comparatively small, but now things are very different. At lunch

time the number present is nearly always large, and throughout the day there is a considerable movement of members in and out. These are healthy signs which should bring the day nearer when the profession and industry of chemistry can support a much larger organisation than is at present the case.

Many things have contributed to the success of the Club. The steady and loyal work put in by members of the Executive Committee and the officers is, of course, the principal factor. Throughout the whole time it can be safely said that the meetings of the Executive Committee have not only always been well attended, but have been peculiarly harmonious. There have, of course, been differences of opinion, but there has never been any question but that the object of every member of the Committee has been to help to improve and maintain the efficiency of the Club.

The Federal Council of Pure and Applied Chemistry, representing as it does all the important scientific bodies, has not only recognised and supported the Club as far as its individual members are concerned, but has lent a hand in its management by allowing three of its members to be co-opted on to the Committee. All these points lend strength to the Club and encouragement to those who are endeavouring to carry it on successfully.

From a statistical point of view the Club advanced regularly year by year until a membership of approximately 700 was attained. This number has been maintained during the last two years, and although the hopes of some that the membership would increase to 1,000 quickly have not yet been realised, it is at least a very satisfactory condition of things that considering the depressing commercial conditions existing in the country the resignations which have taken place each year have been met by at least an equal number of nominees. It is fair to assume from this fact that as soon as trade conditions improve there will be a marked increase of membership. Obviously that increase of membership is desirable, but the Club on its existing membership has been able to maintain its efficiency and keep a balance at the bank on the right side. The very small subscription which is asked from members has not been increased since the Club commenced to occupy its present premises, and it is probably unique among West End Clubs in this respect.

That the Club has helped to bring into the profession and industry a better tone and an increase of sociability is undoubted. That was one of the objects which was prominent when the Club was originally thought of and formed. It was hoped also that it would bring together not only the leaders and older members of the profession and of the industry, but also the younger members. Whilst there are amongst the members a fair number of young men, there has not been as large a number joining as many would have liked to see. This is due mainly to existing trade conditions. It is still hoped that the younger men will see the importance of the Club and the value of membership, but so far they do not seem to have realised it as much as was hoped. In this respect only the Club has not fulfilled the wishes of its promoters.

When the Club was started it was felt that its only chance of real permanent success lay in its proving itself on its merits. It would have been possible, if not at that time in a large way, at least in a small way, to obtain financial support by way of donations which would have made the Club free from financial anxiety during the first critical years. Fortunately it was agreed that the Club should be made a success if possible without such aid, and it is now a matter of mutual congratulation that it has reached its present useful position without financial assistance of any kind, and without any other form of patronage. Whatever may be necessary in the future when the dreams of bigger things come to be realised, the solidity of the foundation upon which the Club has been built can never be destroyed. Nor can the principles which have been maintained throughout be forgotten. The first Chairman of the Executive Committee, Professor W. R. Hodgkinson, C.B.E., fostered these principles during his term of office, and the present and second Chairman, Mr. A. G. Craig, is following up the good work, and both have been backed by sound committees from year to year.

H. E. C.

Oil and Colour Chemists Association

DURING the past years, the importance of placing on a scientific basis the industries grouped under the heading "Oil and Colour," has evidently become more fully appreciated by the manufacturers. The various attempts to form a representative organisation of the technologists which shall be authoritative in drawing up specifications, organising and publishing the results of research work and generally co-ordinating the work of the scientifically trained men in the industry, have excited much interest in the chemical world. Though it cannot be said that the plans for the future are yet definitely formulated, it is certain that we are too far advanced along the road to scientific organisation to make a return to the old apathy conceivable. The O.C.C.A. has consistently worked with the ideal before it of reducing the manufacturing processes of the industry to scientific precision, and thus eliminating the waste and inefficiency due to the vagaries of quality in raw materials, and the individual peculiarities and prejudices which masquerade as trade secrets.

So far as the scientific aspect of the year's work is concerned, the most noticeable feature is the increasing importance of Physico-Chemical method of investigation, particularly in connection with the studies of colloidal systems such a varnishes. Dr. R. S. Morrell's Presidential address, which dealt with the Water Absorbing Properties of Paint and Varnish Films, and the discussion which followed it, illustrate this very clearly. Going still further into the realm of Physics, the Papers by Professor T. M. Lowry and by Mr. A. E. Bawtree on Colour Measurement, and also the joint Meetings with the Faraday Society held in March to discuss the method of measuring the size of small particles, and the significance of the results, are noteworthy as forecasting the possibility of the industrial application of exact methods of measurement of physical properties. Of more direct technical interest was the paper of Mr. H. M. Langton on the saponification of various oils on the industrial scale in which the relative behaviour of lime and magnesia was investigated. As the quantities of oils used ran into hundreds of tons, the importance of the results as a works record cannot be over-estimated. The Association was also indebted to Mr. A. H. Keable for an account of the use of the Sharples Centrifuge Machine, which has become so popular in America and is exciting much interest in this country.

The "Colour" branch of the industries was represented by Mr. F. H. Jennison's paper, entitled "Studies in Precipitation." In view of the fact that the efforts to found a successful dye industry in this country depend largely on the ability of users such as Lake Manufactures to re-adjust their processes to get the best results with products that necessarily differ somewhat from the foreign dyes which formed the bulk of their dye stock in pre-war days, this paper was of particular importance. The author described numerous experiments with elaborate detail carried out on specified dyes, demonstrating the fundamental importance of carefully standardising and measuring quantities and temperatures throughout the whole process of lake making.

Another very important branch of the Association's activities is represented by Mr. W. Bayley Parker's paper on the drafting of specifications for shellac and resins. In the discussion on this subject, several prominent American chemists took part, and there is every reason to believe that this happy occurrence will become a permanent feature of the Association function as a medium for the exchange of ideas. It has indeed been most encouraging to find how readily our American friends responded to the invitation to join in our discussion through the medium of the *Journal*, and so found what Dr. Heckel, of the American Paint Manufacturers Association happily called an "*entente cordiale* between the Paint and Varnish Technologists of the two nations."

The subject of specifications has interested the members of the Association in a still more practical way, for several of them have acted on the various panels and committees appointed by the Government to consider such matters as Shell Paints, Leadless Paint, Aeroplane Dopes, Grinding and Mixing Machinery, and so forth. The above is only a bare outline of the year's work, but it illustrates clearly and undisputably the urgency of the need for the intensive application of science and the wideness and variety of the work which is to be done. The Association can certainly claim to have done much useful work during the year, but its members find even more satisfaction in the fact that the work already done reveals even greater possibilities of achievement in the future.

T. H. B.

The Ceramic Society

This society, first established in 1900 as the North Staffordshire Ceramic Society, has for the past 22 years served to advance the ceramic industries by publishing the results of investigations concerning various questions of importance to those industries. The range of its activities during 1922 has covered such diverse topics as pottery dryers, spit-out of glazes in the enamel kiln, the micro-telescope and the super-microscope, grinding mills for quartz and flint, the ventilation of potters' shops and drying stoves, the gypsum industry, and the crazing of earthenware glazes.

An excursion to Scandinavia in the late spring gave many members the opportunity of inspecting important and interesting factories, etc., in Norway, Sweden and Denmark.

In October, the Refractory Materials Section of the society held a two days meeting in Birmingham, the programme including papers and discussions relating to the action of heat on fireclays and other refractories, and to some new forms of kilns, etc.

The transactions contain, besides reports of papers and discussions, useful abstracts from a long list of British, foreign and American technical journals.

Forthcoming papers and discussions announced for the near future include boilers and engines, chemical stoneware, pyrometry, industrial fatigue, thermal strains in pottery bodies, old Roman kilns, opacifying materials, etc.

The Hon. Secretary of the Society is Dr. J. W. Mellor, and its headquarters are at the Central School of Science and Technology, Stoke-on-Trent.

J. A. A.

Chemical and Dyestuff Traders

The Chemical and Dyestuff Traders' Association was formed in May, 1920, to watch over the interests of merchants and generally to assist them in their dealings with Government Departments and other organisations. During the last twelve months it has been unceasing in its efforts to minimise the difficulties and hardships arising from the administration of the Dyestuffs Act and Safeguarding of Industries Act both by the Board of Trade and the Customs. That it has been successful is shown by the testimony of those of its many members who have appealed to it.

It is admitted that the Safeguarding of Industries Act has gone beyond the object for which it was originally passed, viz., the protection of key industries, particularly applicable to war. Largely owing to the manner in which these Acts were rushed through the House of Commons and to the failure of the Board of Trade to recognise and consult with those most experienced in the trade, the Acts have failed to accomplish their object and their administration is not only hampering and hindering national trade, but is also inflicting much hardship and injustice on *bona fide* traders, whose long-established business is seriously imperilled by Government action.

The Association continues to use all legitimate means promptly to eliminate all articles and modify all actions not strictly coming within the original intention of the Acts and will not rest satisfied until the Acts are either radically amended or actually ended.

J. J. B.

British Chemical Trade Association

The British Chemical Trade Association has had a very successful year, during which its work on behalf of chemical merchants has been increased and the scope of its activities widened in many directions. For some years since its inception in 1918 the Association suffered from lack of support from many of the older and important firms in the trade. This has been gradually overcome, and with the election of Mr. Victor Blagden (Victor Blagden and Co., Ltd.) as the President and Chairman in January last, many of the firms who had stood out have since supported the organisation by their membership.

As is to be expected, the Association's work has been chiefly concerned with protecting the merchants' interests in connection with the Safeguarding of Industries and Dyestuffs Acts. With representatives on the National Vigilance Committee at the London Chamber of Commerce a vast amount of work has been carried out successfully through this medium both in taking appeal cases before the Referee and in Parliamentary activities. During the twelve months under review the Association was instrumental in raising fifty-six questions in the House of Commons. Several leaflets and letters were circulated to members of the Houses of Lords and Commons, and these were often quoted in debates. The Association has made a special point of securing a strong Parliamentary party to voice their complaints in the House, and no doubt the Safeguarding of Industries and similar legislation affecting the trade will be constantly before the House through their activities in this direction. During the year something like 5,000 copies of 47 issues of bulletins have been issued to members. Over 2,500 inquiries on the widest of subjects have been dealt with. During the five years of its existence the Association has steadily built up on a solid foundation an organisation that is now performing its functions in a highly successful manner. The coming year is confidently expected to see the Association make further progress towards the goal aimed at. The London offices at 80, Fenchurch Street, E.C.3, are now much used by the members, and very shortly a branch will be opened in Manchester.

B.

British Sulphate of Ammonia Federation

Although the past year has been free from the alarums and excursions of the previous twelve months, the Association has had to reckon with the nitrate of soda propaganda. On this account it is interesting to note that when other fertilisers were hard to sell buyers of sulphate of ammonia could not get their deliveries fast enough.

From the point of view of the producer, the average price obtained for sulphate during the year was disappointing. The present price of sulphuric acid is still about 100 per cent. over the pre-war price, and will have to be reduced if sulphate of ammonia makers are to adjust their cost of production to the level of the selling price for nitrogen. The market policy adopted by the Association has met with general approval among members, and steps are being taken to prevent a repetition of the shortage of stocks which existed in the spring by asking members to be prepared slightly to increase the storage capacity at their works.

With regard to membership, although members had the opportunity of terminating their membership in May, members with a capacity of 3,556 tons per annum took this opportunity, but there still remain members with a capacity of about 300,000 tons, representing over 90 per cent. of British production. A new member with large productive possibilities is Synthetic Ammonia and Nitrates, Ltd.

Attention has been devoted to methods of reducing production costs to a minimum and to effecting economies in the cost of administration and in charges of transportation and distribution. The Association has reclaimed £2,440 from the railway companies for overcharges and rates wrongly charged since last January, and their cost of administration is now only about 1s. 4½d. per ton.

The great difference between the consumption of nitrogen in Germany on the one hand, and in the United Kingdom and France on the other, shows that there is a vast field for extension of the Association's work, which must continue in the main to be educative. An important feature of the Association's work during the year has been its support of the scientific and educational work carried on at Rothamsted. It is intended to continue this support and also to render assistance to other agricultural institutions.

Presentation to Professor H. B. Dixon

At the annual dinner of the Salford Royal Technical College, held at the Grand Hotel, Manchester, on December 21, a presentation was made to Professor H. B. Dixon on behalf of the College staff as a mark of their appreciation of his interest in the College. The presentation consisted of a portrait of Professor Dixon, and an illuminated address, in which the Principal, Dr. B. Prentice, and the members of the staff placed on record their appreciation of the fact that although Professor Dixon had relinquished his position as director of the chemistry department of the Manchester University, he still retained his active interest in the work of the College as the chairman of its committee. Reference was also made to the valuable assistance rendered by Professor Dixon in the past in all that concerned the welfare of the College and the development of technical education in Salford.

"Chemical Age" Letters from America.—VIII.

Some Concluding Impressions—Princeton University—Chemical Engineering in America—The Foundations of Club Life

Chemists' Club, New York.

THESE casual impressions must at last come to an end, and they cannot close more appropriately than with the year to which they relate, and in this wonderful city where the writer's journeyings began and terminated. First a word must be said of a pleasant day spent in exploring Princeton University and a night at the Peacock Inn, named after a famous Derbyshire hostelry dear to the heart of the northern week-ender. Princeton, like all American institutions, lacks the mellowness of age which enriches the old English scholastic foundations, but it has a character and dignity of its own, and on an autumn day, when the trees are taking on their final tints and the buildings are seen through a soft haze of colour, it is a picture not readily forgotten. Professor Hugh S. Taylor was only recently back from England, and it was under his cheerful guidance that our tour of the colleges was made. The amount of building in progress was the best evidence of the growth of Princeton, and I gathered from Professor Taylor that on both the classical and the scientific sides the accommodation barely keeps pace with the increase in numbers. There are only very few English students, and one of this year's freshmen who accompanied us was Mr. John Benn, eldest son of Sir Ernest Benn, who is just entering on a four years' course. It must be a sharp change from the exclusiveness of Harrow to the democratic atmosphere of Princeton, where young fellows help to pay their college fees by taking on duties as waiters on their fellow-students, and are thought none the worse of for it. It is the sort of atmosphere in which manhood flourishes and snobbery finds it hard to survive.

One of the small duties I had planned on returning to New York was to inquire into the work of the American Institute of Chemical Engineers. I judge from conversations with Dr. Jerome Alexander that the Institute, which was founded in 1908, has thoroughly justified itself. On inquiring into the academical status of the members I was irreverently told by a well-known doctor of science that in America "degrees don't matter a dam"; the thing that counts is the man. The qualifying period for membership, it is true, is reduced in the case of graduates, but what the Institute essentially stands for is a high standard of practical achievement and an equally high standard of professional ethics. No attempt appears to have been made by the Institute to organise examinations of its own nor to unify the courses of instruction in chemical engineering at the collegiate and technical centres. The emphasis is placed rather on proved practical experience and achievement, and the organisers seem well satisfied with the influence the Institute has been able to exert on professional qualifications and practice. At the same time chemical engineering is successfuly taught in many of the universities. Among those I met here was Professor McKee, professor of chemical engineering at Columbia University, who, while recognising the excellent work of the Institute, feels that it in no way lessens but rather emphasises the importance of thorough education in the science. Incidentally he referred to the five volumes in the "Chemical Engineering Library" recently published by Benn Brothers, Ltd. He, like others, had been attracted to them by Professor Hinchley's review, and he remarked that, having read the first two volumes, he asked the librarian to order the whole series for the University library. A pleasant instance of the close relations which bind British scientists on both sides of the Atlantic. It was interesting to find, also, that "Dr. Lagueur," of CHEMICAL AGE fame, is known here and much enjoyed.

One cannot take leave of this hospitable club without a closing word as to its admirable management. Of many impressions two may be selected for mention. The first is its thoroughly democratic basis. The club has been handsomely endowed by generous benefactors from time to time, but there is no record of any of them seeking to impose their own notions or prejudices on the free action of the management. Nor can I imagine the members, heartily as they appreciate such help, consenting to accept, much less to solicit, anything in the shape of patronage, official or unofficial. Among its members, resident and non-resident, I was interested to find several newspaper colleagues. Another interesting scheme which Mr. Holmes briefly outlined to me was one for bringing into association with the club men of influence whose work, though not strictly chemical, may have close relations with chemical industry. For example, a banker may on a strict interpretation be held to be not directly interested in chemical industry, yet, if a new enterprise is to be started or a new process put in commercial operation, a banker's influence may be a very important factor. In this way, instead of seeking to sterilise chemical industry by segregating young chemists to themselves, the club is seeking to extend its borders and establish links of connection with outside activities. Liberty, equality, fraternity—these, and freedom from divisive under-currents, are the basis on which the Chemists' Club has been founded, and will, I trust, long flourish.

Of American hospitality I cannot trust myself to speak; nor of the goodwill towards this country that meets one on every side; nor of the heartiness with which Americans meet more than half-way every friendly approach from this side; nor of the friends in every State whose one concern has been to make one welcome. The last few days in New York—the final meetings and the pledges of remembrance—will long remain a delightful memory. And in no single American could all these feelings have been more happily personified than in that good Christian, Ellwood Hendrick, whose departing figure was the last I saw from the deck of the Baltic, after he had faithfully discharged his duty of seeing me safely off Manhattan Island.

F. E. HAMER.

Municipal Research Work

Interesting Developments at Birmingham

INTERESTING developments are announced at the Industrial Research Laboratories of the Gas Department of the Birmingham Corporation, and several visits by technical societies have lately been made to them. The work carried out is very varied, and deals not only with the use of gas, but the composition of metals, the heat treatment of steels, bronzes, aluminium, and the many special alloys which enter into manufactures, and physical and mechanical testing, for which plant has been erected. Research work has also been conducted relating to electrical appliances, glassware, and articles of ferrous and non-ferrous metals. A considerable amount of research work has been carried out with the aid of photomicrographical apparatus installed in the laboratories for the examination of steels, brasses, bronzes, and other alloys. The laboratory is run on a self-supporting and non-profit-making basis, so that any experimental work carried out for a manufacturer simply costs him the value of the time taken and any incidental expenses. The laboratory has been instituted with the object of rendering service to manufacturers in the work of investigation and research and does not undertake ordinary analytical work usually performed by consulting chemists.

In new demonstration rooms there have been installed a variety of gas-heated furnaces and apparatus, including furnaces for annealing, and hardening soldering irons, and heavy furnaces for metal melting, as well as an ammonia refrigerating plant, operated by gas, and an ice-making plant. There is shortly to be installed in the main physical testing laboratory a 100-ton vertical Avery testing machine.

Dr. C. M. Walter, the engineer in charge, in welcoming the Midland Branch (Graduates' section) of the Institution of Mechanical Engineers, pointed out that the object of the Corporation in setting up the research laboratories was to assist the manufacturer in all his problems. They did not compete with, or desire to clash with, private practitioners. They existed to collaborate with manufacturers in carrying out work of a scientific and investigational character. Everybody realised to-day that scientific knowledge in industry was of vital importance, and it was the Corporation's desire to assist any manufacturer to solve problems confronting him in regard to his business. Research work was undertaken without any regard to its effect on its sale of gas.

Sulphuric Acid Manufacture

The Theory of the Chamber Process

At the last meeting of the West Cumberland Association of Chemists, Chemical and Metallurgical Engineers, held at the Technical College, Workington, Major C. Irwin, of the West Cumberland By-Product Co., Ltd., read a paper entitled "Notes on the Theory of the Chamber Process of Sulphuric Acid Manufacture." The chamber process for sulphuric acid, said the lecturer, covers all types of plant using oxides of nitrogen as a means of promoting the oxidation of SO_2 to SO_3. This process had been, for a chemical one, remarkably long in the field. Plants had been erected in the last year or two differing very little from those built between 1870 and 1880. This had not been for lack of effort to modify it. Professor Armstrong said recently that in inorganic chemistry theory had not kept pace with practice, and instanced the fact that the structural formula of sulphuric acid was still uncertain. He (the lecturer) was inclined to think, too, that applied theory had also lagged behind. Having read all the journal articles and patent specifications published in England, France, Germany, and America dealing with sulphuric acid he was impressed by the number of schemes brought forward which were mere empirical shots in the dark, and not founded on any clear theoretical basis. Some inventors, of course, ignored practical difficulties in chemical engineering, but the disregard of the foundation which theory could give was much more common. The objects in view of every improvement in this process were: (1) Obtaining the greatest output with the lowest annual charge for depreciation of capital, (2) economy in nitrate, (3) economy in labour. Of these, the first was the more important.

To see what lines we must proceed on to obtain these improvements, continued Major Irwin, the chemical equilibria of the reaction must first be examined. There was present in a lead chamber, (1) gas, (2) mist. In the gas there was a percentage of SO_2, which fell from the beginning to the end of each chamber, but not regularly. Oxygen was always present, and certain oxides of nitrogen. The mist consisted of a mixture of the aqueous solution of sulphuric acid and of nitrosyl sulphuric acid $SO_2.OH.ONO$. It contained no nitric acid. The reaction proceeded between the gas and the mist particles. Since there was no nitric acid found in the condensate under normal conditions, there must be for each molecule of NO_2 in the gas at least one of NO, or they might be considered as associated as N_2O_3. The latter could not usually exist as such at atmospheric temperatures. It is associated into its components, though it was known as a liquid (perhaps) and solid at low temperatures. Nevertheless, the mixture found in the chambers behaved chemically as N_2O_3, though physically it might be dissociated. In addition there was a further quantity of excess NO which diminished from the beginning to the end of the system.

The above were experimental facts; the equations which summarised them were:—

Gas Mist

A. 1. $SO_2 + NOOH + O = SO_2OH.ONO + heat$

Mist $+NOOH$

2. $SO_2OHONO + H_2O = H_2SO_4.mist + gas + heat$

B. In excess of SO_2.

$$SO_2OH.ONO + SO_2 + 2H_2O = 3H_2SO_4 + 2NO$$

the NO being reoxidised to N_2O_3.

This summary of the equilibrium was that of Lunge, and was, he thought, incontrovertible. The explanation of the chamber process usually known as that of Berzelius was very incomplete.

Acceleration Factors

With the help of these equations it was possible to predict the factors necessary to accelerate the reactions. Coming first to the question of temperature, the lecturer said the heat liberated must be removed (1) to avoid the damage to leadwork caused by too high a temperature (2) to enable the mist phase to remain sufficiently dilute to allow reaction (2) to proceed at speed equal to (1). Cooling slowed down the reaction velocity of (1) in which only the gaseous phase was concerned. There must therefore be an optimum temperature of formation. A still better yield could evidently be obtained by rapid alternate heating and cooling. If a chamber mist of a certain concentration was cooled it was necessarily diluted, and reaction (2) was accelerated. If it was then heated again reaction (1) proceeded more strongly. Such an effect was produced near the chamber wall by the cooling of the air. And since the cooled gases had a tendency to sink and the warmer ones to rise, the gases would traverse a spiral course in a vertical plane. This effect was produced in any chamber of any form, and was a proved fact. It would, however, be much more marked in a high chamber of narrow cross-section up which the gases passed vertically, especially if the walls were water-cooled, than in larger rectangular chambers.

This view also accounted for the rapid formation of acid in the connection pipes between chambers where external cooling was marked. As the gases passed along a rectangular chamber the intensity of the reaction diminished according to the principle of mass action, the temperature of the main gas mass fell, but that of the chamber wall remained almost constant by conduction. The effect of the cooling wall was therefore diminished, and the slowing down of the reaction was cumulative. The sharp cooling of the outlet connection gave the process a kick, and it proceeded with new speed in the next chamber. Looking back to equations (1) and (2) it would be noticed that (2) would be accelerated by excess of water up to the limit where other reactions set in. Hence the use of as many water sprays as possible, especially in earlier hot chambers would accelerate the reaction. They would also by their local cooling produce an effect similar to that of the chamber walls.

Returning to the equations again and remembering that (2) involved interaction between a gas and a mist, it was evident, said the lecturer, that the smaller the mist particles, the greater the intensity of reaction. This principle was the foundation of all the systems which included some form of packing, Lunge towers, Opl towers and all the numerous other forms. Their principle was continually to coalesce the mist into drops which fell on the next tray and are broken up by impact, and this again produced an acceleration of the reaction. In addition, a packed tower, if fed with nitrous vitriol as is the Glover tower, had the advantage of the counter-current principle, which was lacking in rectangular chambers. All the modifications of the chamber process which this study of the essential reactions had hinted at, must, of course, be judged not only by their engineering practicability, but by the final economic test of depreciation and maintenance charge per ton of acid made. A greater intensity of reaction might be bought too dearly.

Loss of Oxides of Nitrogen

Dealing with the question of economy of nitre, Major Irwin said that although the equations summarising the chamber process indicated no loss of oxides of nitrogen, in practice a loss occurred which, even under the best conditions, was rarely less than 3 parts sodium nitrate to 100 parts sulphur burnt. The causes of this loss were various. The first one which might be suggested was the possible reduction of nitric oxide to nitrous oxide or nitrogen. If this took place such gases would escape as they were insoluble in sulphuric acid. From a consideration of the equations

(4) $SO_2\ (OH)\ ONO + SO_2 + H_2O = 2H_2SO_4 + NO$

(5) $SO_2\ (OH)\ ONO + 1\frac{1}{2}SO_2 + 2H_2O = 2\frac{1}{2}H_2SO_4 + \frac{1}{2}N_2O$

it would be observed that the tendency to formation of nitrous oxide was increased by excess SO_2, but even more so by excess moisture. Experiments had shown that equation (5) took place to a slight extent in presence of aqueous mist, but not at all in a mist of such moderate concentration as 1·32 sp.gr. The water necessary in the chamber process was supplied by sprays or steam jets, and the only points in the circuit where a mist of concentration below 1·32 could possibly exist were around such sprays or jets before mixture took place. The conclusion must therefore be drawn that numerous small jets or sprays were safer than a few large ones.

There was another point at which works which supplied their nitre by running nitric acid down the Glover tower might experience a loss due to a similar reaction and that was at the point of introduction of nitric acid if the latter was somewhat dilute.

Before this nitric acid became mixed with the sulphuric acid also running down the tower it was exposed to abundant SO_2 and dilute acid mist, and if it contained much water

Continued on page 946.

From Week to Week

MR. G. G. WILLEY, manufacturing chemist, has removed to 7, Boltons Court, Blackburn.

SLIGHT DAMAGE to a drying kiln was caused by fire at the premises of the Fuller's Earth Union, at Nutfield, Surrey.

MR. JOHN H. JONES has been appointed by the Delegacy of King's College, London, to an assistant lectureship in physics.

THE CRIMINAL INVESTIGATION of the American Chemical Foundation by a Federal grand jury in Washington has been abandoned.

IT IS REPORTED that the strike at the Ludwigshafen chemical and dye works has been settled, all the workmen except the strike leaders being reinstated.

NOTICE is given in the *London Gazette* that the name of the British Resorcin Manufacturing Co., Ltd., has been struck off the register and the company has been dissolved.

EXPERIMENTS in the use of uranium and conglomerate ores in a pulverised form for fertilising purposes are being carried out at Tezpore, Assam, by Mr. G. F. Hall.

MR. ANDREW MACDONALD, senior partner of John Poynter, Son and Macdonalds, manufacturing chemists, Greenock, died at Orotava, Teneriffe, on December 16 in his 76th year.

MR. W. H. RAINE, of A. Sanderson and Co., Ltd., paint and varnish manufacturers, and Mr. E. Keighley, oil cake manufacturer, have been appointed Justices of the Peace for Hull.

THE ANACONDA CO., already one of the largest mining undertakings in the world, is said to be further extending its operations by acquiring a controlling interest in the Chile Copper Co.

APPLICATIONS are invited for the lectureship in physics at the Queen's University of Belfast. Particulars of the appointment are obtainable from Mr. J. M. Finnegan, secretary of the University.

COLONEL KENYON VAUGHAN-MORGAN, M.P., a director and vice-chairman of the Morgan Crucible Co., Ltd., underwent an operation on December 21, and is understood to be progressing satisfactorily.

HOPKINS, ELLIS AND CO., who have taken over the chemical department of the Products Corporation, Ltd., announce that they are now carrying on the business under their own name at 594/6, Salisbury House, London Wall, London, E.C.2.

WE REGRET to record the death on December 23, in Guy's Hospital, London, of Mr. Robert George Grimwood, F.I.C., of "Wytherstone," Brighton Road, Coulsdon, Surrey, after three days' illness. The interment took place at Seal on Thursday.

ALTHOUGH their name was not published in our preliminary list of exhibitors in the Chemical Section of the British Industries Fair, 1923, we are informed that Intermediates and Explosives, Ltd., of Middlesbrough, intend to exhibit specimens of their intermediates and explosives at the White City.

DR. HOWARTH, Medical Officer of Health for the City of London, urges that on each packet of borax sold to the public there should be a label stating whether the article is pure borax—from which arsenic has been removed, or commercial borax—in which there is still arsenic. It is most important to ensure, he adds, that the product sold for use in connection with food processes is pure.

A REMARKABLE FEATURE of the agreement whereby Reckitt and Sons, Ltd., purchased the assets of Hargreaves Brothers and Co., Ltd., is that Mr. G. P. Hargreaves, chairman and managing director of the latter company, is debarred from entering into any similar trade in the whole of the world for twenty years. For this undertaking he receives a compensation fee from Reckitt and Sons.

THE PRICE OF PITCH has been gravely embarrassing the South Wales Patent Fuel industry, and the difficulty is now increased owing to the rise in the market, which a fortnight or so ago fell. Pitch is now quoted at £6 6s. to £6 15s. per ton, compared with 35s. pre-war, and should it go up still further it may mean that works will have to close down. At Swansea, two works—the Cambrian and the Atlantic—are already idle, and other factories are working intermittently.

IN ANNOUNCING that a sum of £855 was received in response to the British appeal in connection with the Pasteur Centenary, Mr. A. Chaston Chapman, who is treasurer and secretary to the British Committee, states that the questions of commemorating the centenary in this country and of deciding the form which it should take, are still under discussion. A supplement to *Nature* last week contained articles on Pasteur's work in crystallography, pure chemistry, and the fermentation industries, by Dr. A. E. H. Tutten, Professor A. Harden, and Professor A. R. Ling, respectively.

OFFICIAL REPORTS show a considerable decrease in the number of United States establishments engaged in making sulphuric acid, nitric acid, and mixed acid during the year 1921 as compared with 1919. The total value of products reported for 1921 amounted to $20,529,000, and for 1919 to $31,470,000, a decrease of 34·8 per cent. Of the thirty-five establishments reported in 1921, five were located in New Jersey, five in Pennsylvania, four in Ohio, three each in California and New York, two each in Maryland and Virginia, and one each in Alabama, Arkansas, Colorado, Connecticut, Illinois, Kansas, Massachusetts, South Carolina, Tennessee, Texas and Utah.

A CONFERENCE on Industrial Fuel will be held in Paris next spring under the patronage of M. Le Trocquer, Minister of Public Works, and with the support of the Société d'Encouragement pour l'Industrie Nationale. The proposed agenda includes discussions on the assay of various fuels, rules for testing boilers, producers and furnaces, standard methods of making measurements required in controlling the use of fuel, construction of furnaces, use of pulverised fuel and of low-grade fuels. Any communications concerning the conference should be addressed to the Président de la Commission d'Utilisation du Combustible, Ministère des Travaux Publics, 246 Boulevard Saint Germain, Paris.

THE REPORT of the Committee appointed under the chairmanship of Sir R. Henry Rew, to inquire into the complaint under Section 2 (1) (b) of the Safeguarding of Industries Act respecting optical elements, and optical and other scientific instruments manufactured in Germany, is to the effect that the conditions laid down in Section 2 (1) of the Act are not fulfilled except in regard to (a) metal spectacle frames and eyeglass mountings, and (b) mathematical drawing instruments. The Board of Trade, after considering the report, have decided to make no order under Part II. of the Act arising out of the complaint in question. The report has been presented to Parliament and published.

IN THE COURSE of the experimental work at the Fuel Research Station, Greenwich, it has been necessary to determine the specific gravities of the various gases produced. Where the gases have been made in bulk the Wright's Effusion Bell method has been satisfactorily used; the method cannot however, be usefully employed for gases prepared on the laboratory scale. For this reason an apparatus has been devised for specific gravity determinations of small samples of gas, the degree of accuracy being 0·5 per cent. for values between 0·4 and 0·6 (air = 1). The apparatus is described and figured in the Fuel Research Board Technical Paper No. 5, recently published by H.M. Stationery Office at 3d. net.

THE PHYSICAL SOCIETY and Optical Society's annual exhibition, which is to be heldon Wednesday and Thursday, January 3 and 4, at the Imperial College of Science, South Kensington, will be open in the afternoon (from 3 to 6 p.m.), and in the evening (from 7 to 10 p.m.). Mr. W. Gamble will give a lecture on "Reproduction of Colour by Photographic Processes" at 4 p.m. on January 3 and 8 p.m. on January 4. Professor E. C. Coker, F.R.S., will give a lecture on "Recent Photo-Elastic Researches on Engineering Problems" at 8 p.m. on January 3 and at 4 p.m. on January 4. Over fifty firms are exhibiting scientific apparatus and a number of experimental demonstrations have been arranged.

IN A LETTER to *The Times* regarding the administration of the Safeguarding of Industries Act, Mr. F. W. Gamble, of Allen and Hanbury's, Ltd., cites the case of one firm who, having appealed against the inclusion of an article in the list of dutiable articles, had to wait six months for the case to be heard. During this period, he states, a sum of nearly £3,000 was collected in duties on this article, and, notwithstanding the fact that the referee declared that such article had been improperly included, and therefore was not dutiable, the Department concerned has refused to refund this money. The firm itself was prepared to establish the correctness and equity of its case for the removal of the article from the schedule within a few days of formal notification, and but for the delay on the part of the Board of Trade either no duties whatever, or possibly duties of a negligible amount only, would have become payable.

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Abstracts of Complete Specifications

189,160. SULPHATE OF LEAD, PROCESS FOR THE MANUFACTURE OF. J. Gitsham and H. R. Evershed, 175, George Street, Launceston, Tasmania. Application date, May 31, 1921.

The process is for the manufacture of sulphate of lead direct from lead sulphide ore by vaporising it in an electric furnace and oxidising the vapour by means of air. The lead sulphide ore is very finely divided, and is fed by a rotary measuring device to an electric furnace containing three arcs. The vapour and air are drawn through a flue containing a series of fine water sprays and steam jets, and the water containing sulphate of lead passes to settling tanks. Free acid is added in the tanks to convert any sulphites and oxides into sulphates, and to float off any unchanged lead sulphide. In some cases the addition of acid may not be necessary since the ore may contain sufficient sulphur to provide the acid necessary for conversion of the sulphites and oxides. Any excess of acid in the mixture is neutralised with lime water, and the lead sulphate is separated by settling.

189,190. TANNING J. Y. Johnson, London. From Badische Anilin- & Soda-Fabrik, Ludwigshafen-on-Rhine, Germany. Application date, August 18, 1921.

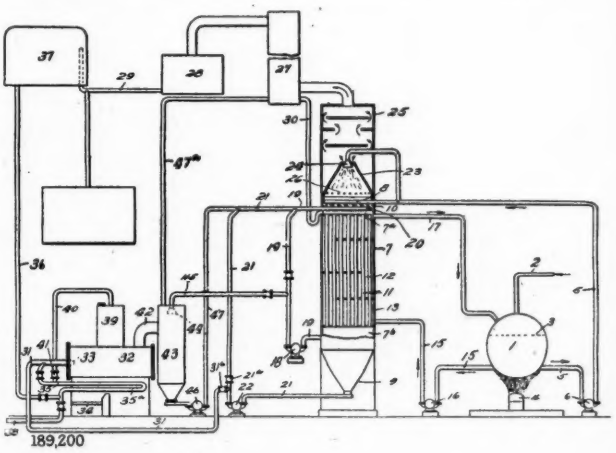
A new series of tanning agents for leather comprises the condensation products derived from ketones, oxy-ketones or oxy-aldehydes, and polyvalent aromatic hydroxy compounds containing no sulphonic groups. The starting material may be waste sulphite liquor or other similar products of the decomposition of wood containing oxy-aldehydes or oxy-ketones, such as products of the saccharification of wood. These condensation products are not readily soluble in water, but may be dissolved in aqueous solutions of simple organic sulphonic acids such as toluene sulphonic acid, and the solutions may be used as tanning agents. In an example, a small quantity of hydrochloric acid is gradually added to a solution of resorcinol in acetone. Water is added, and the mixture then neutralised with chalk, and the condensation product extracted with ether. The ether is evaporated, and the compound remaining as a residue is soluble in water and acts as a tanning agent. In a modification of the process, tanning agents are produced from waste sulphite liquor or other similar products and monovalent non-sulphonated aromatic phenolic substances by condensation with alkali. These products may be used in conjunction with water-soluble synthetic tanning materials, including waste sulphite cellulose liquor. Numerous examples are given.

189,193. CALCINING OR ROASTING ORES, OR LOW TEMPERATURE DISTILLATION OF FUEL, APPARATUS FOR. J. F. Wake, 123, Victoria Road, Darlington. Application date, August 19, 1921.

A horizontal cylindrical casing is divided by an internal partition in the form of a spiral of several convolutions, so that a continuous spiral passage is formed extending from the centre to the circumference. The material to be treated is fed to the centre, and is caused to travel outwards through the spiral passage by rotating the casing. Hot air or combustion products from a furnace are passed through the spiral passage in counter-current to the material. The inlet and outlet may be formed of hollow trunnions on which the apparatus is supported.

189,200. CONVERTING HIGH BOILING POINT OILS INTO LOW BOILING POINT OILS, PROCESS FOR. E. C. R. Marks, London. From the Hoover Co., 230, East Ohio Street, Chicago, U.S.A. Application date, August 22, 1921.

The apparatus is for obtaining low-boiling hydrocarbons such as gasoline from high-boiling hydrocarbons by the aluminium chloride contact method, and for regenerating the aluminium chloride. Crude oil is supplied to a preheater 1, and the heated oil is forced by a pump 6 through a pipe 5 to a distributor in the top of the contact chamber 7, which is kept filled to the level 10 with the oil to be treated. The chamber 7 is divided into compartments 7^a, 7^b, 11, the latter containing a set of tubes 12. Crude oil is supplied to the space surrounding these tubes from the preheater 1 by the pump 16 so that the chamber is maintained at the proper reaction temperature. The tubes 12 may be heated by other methods, such as by passing the combustion gases from the burner 4 through the space 11. The circulation of the mixture of hydrocarbon and aluminium chloride through the tubes 12 is maintained by a pump 18. The aluminium chloride which settles to the bottom of the chamber 7^b is maintained in circulation by means of a pump 22 through a pipe 21. The mixture of light and heavy hydrocarbon vapour and aluminium chloride vapour is treated with a spray of heavy oil from the nozzle 24 so that the heavier vapours are washed back into the still. The lighter vapours pass into the chamber 25, where more of the heavy vapour is condensed and returned. The light vapour passes into a reflux tower 27 to effect a final purification, and gasoline is condensed in the condenser 28. The condensed heavy hydrocarbons are returned to the still through a pipe 30. The aluminium chloride, mixed with heavy hydrocarbon, is regenerated periodically by diverting it through a valve 31^a to a vaporising chamber 32. This is done when the proportion of asphaltic and free carbon constituents in the residue is not

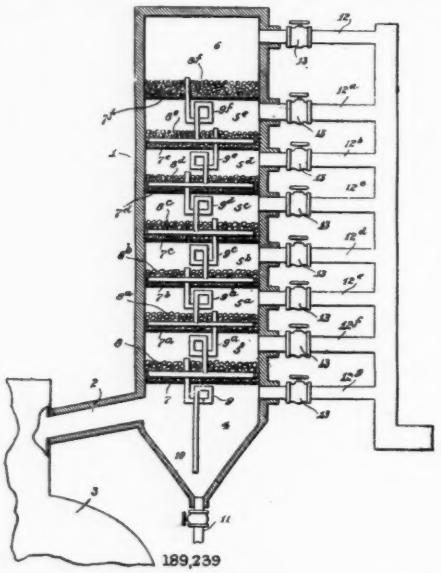


more than 25 per cent., so that the aluminium chloride is easily recovered as such. The chamber 32 is heated to 400° F., and the mixture is expanded into it, so that the aluminium chloride is vaporised together with some of the oil. The mixture injected into the chamber 32 is perfectly preheated by means of gas which is passed through a coil 35^a in the furnace, and injected into the pipe 31. This gas may be hydrochloric acid or chlorine, so that loss of chlorine from the aluminium chloride is replaced. Any loss of aluminium chloride is replaced by passing the gas over metallic aluminium in a chamber 39. The distillate passes through a flue 42 to a chamber 43, where it is condensed by an oil spray from a pipe 45, and is then returned by a pipe 46 to the still 47. Any lighter vapour passes through a pipe 47^a to the reflux tower 27.

189,239. PETROLEUM, METHOD OF AND APPARATUS FOR THE FRACTIONATION OF. H. P. Straus, Minatitlan, Vera Cruz, Mexico. Application date, August 29, 1921.

The object is to obtain an increased yield of gasoline by the fractionation of petroleum in a continuous process. A column 1 is divided into compartments 5, 5^a, 5^b, 5^c, 5^d, 5^e, 5^f, by perforated metal plates 7, 7^a, 7^b, 7^c, 7^d, 7^e, 7^f, which support contact material 8—8^f. Liquid is carried from one compartment to the next by reflux tubes 9—9^f, which are looped as shown to prevent flow of vapour in the reverse direction. Each tube terminates in the contact material supported on the plate next below. Vapour pipes such as 12 are provided for each compartment, and discharge into a common main. Vapour from the still 3 passes into the column 1, and passes upwards through the contact material in which some of the

vapour is condensed. The condensate accumulates until it overflows into the tubes 9—9¹. Reference is directed in pursuance of Section 7, Subsection 4 of the Patents and



Designs Acts, 1907 and 1919, to Specifications Nos. 3468/1889, 20,434/1889, 25,676/1901 and 19,780/1907.

189,295. DYESTUFFS OF THE TRIARYLMETHANE SERIES, MANUFACTURE OF. British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, J. Baddiley and E. H. Rodd, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, October 5, 1921.

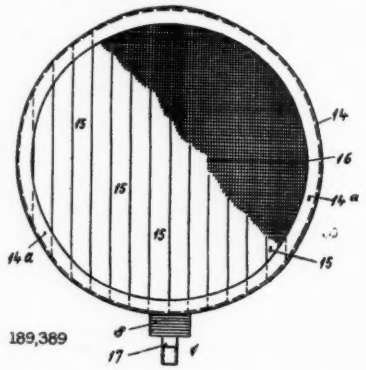
These dyestuffs are prepared by condensing a 4 : 4¹-dialkyl-diamino-3 : 3¹-dimethylbenzophenone with a tertiary or secondary aromatic amine and a condensing agent such as phosphorus oxychloride. Suitable amines mentioned are dimethyl-aniline, ethyl-benzyl-aniline, dibenzyl-aniline, alkyl-*o*-toluidine ethyl α-naphthylamine and phenyl-naphthylamine. To produce the ketones required mono-alkyl-*o*-toluidines are condensed with formaldehyde, and the resulting diphenyl-methane derivatives are converted to the thio-ketones, which may be hydrolysed to produce the ketones. The dyestuffs which contain a benzyl, phenyl, or naphthyl residue as substituent in the amino group, may be sulphonated to yield acid dyestuffs which dye wool red-violet.

189,367. VAT DYESTUFFS. R. B. Ransford, London. From L. Cassella and Co., Ges., Frankfurt-on-Main, Germany. Application date, September 29, 1921.

These dyestuffs are prepared by heating 2-methyl anthraquinone or an omega-halogenised derivative with sulphur and an aromatic compound containing the para-diamine group : $\diagdown\!\!\diagup \overset{N}{(p)} - \text{Aryl} - \overset{N}{(p)} \diagdown\!\!\diagup$. Suitable para-diamines are benzidine ; *p*-phenylene-diamine, and its substitution products. Nitro or azo compounds which during the reaction yield para-diamines as intermediate products, such as *p*-nitraniline or *p*-amino-azobenzene, may also be used. The dyestuffs may be purified by treating with oxidising agents such as sodium hypochlorite. These dyestuffs are superior to those obtained by heating 2-methyl-anthraquinone with sulphur alone.

189,389. FILTERS. G. Dorner, 6, Seidenbänderstrasse, Berlin, and Deutsche Werke Akt.-Ges., 12A, Bellevuestrasse, Berlin. Application date, March 2, 1922.

This filtering apparatus is of the kind in which the liquid contains floating filtering material. An air-tight casing is provided with a number of flat vertical filtering elements, and the liquid to be filtered is supplied to a horizontal perforated tube in the upper part of the casing. The filtered liquid passes into the interior of the filtering elements, and is discharged through pipes 17 to a common discharge pipe. Loss of liquid from the casing is prevented by providing the outlet of each filtering element with a rubber packing 8 which is compressed by means of a screw passing through a removable horizontal pivoted bar across the casing above the filtering elements. Each filtering element is of flat circular shape having a metal rim 14 with inturned metal flanges 14*a*. The face of each filtering element is composed of a number of separated parallel vertical strips 15, which are covered by a wire gauze 16 which



intercepts the fine filtering material (*e.g.*, asbestos fibre) contained in the liquid. The filter may be used for liquid which does not contain its own filtering material, in which case the filtering elements are covered with filtering paper or cloth held in position by annular side frames which are bolted together.

189,399. WASHING OR SEPARATING ORES, APPARATUS FOR. M. Whitworth, Crumpwell, Oswestry. Application date, April 28, 1922. Addition to 164,270.

A separating tank is provided with a perforated false bottom, and the space below is divided by transverse partitions into a number of separate compartments. Water is supplied to these compartments, and issues into the tank through the perforated false bottom, while the material to be treated is fed into the tank at one end and carried forward by another stream of water over the perforated floor. The whole apparatus is slightly inclined downwards towards the inlet end, *i.e.* in reverse direction to the flow. The material passing over the floor is lifted upwards by the jets of water from the perforations, and the lighter material is raised to the top and carried forward by the stream of water bearing the material. This lighter material is discharged over the weir at the opposite end, and the heavier material falls back into the lower end of the tank.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention : 181,375 (Aktieselskabet de Norske Saltverker), relating to production of anhydrous magnesium chloride, see Vol. VII., p. 248 ; 185,107 (Consortium fur Elektro-Chemische Industrie Ges.), relating to the manufacture of resins, see Vol. VII., p. 612 ; 185,403 (Farbwerke vorm. Meister, Lucius & Brüning), relating to the manufacture of thiohydrins, see Vol. VII., p. 652.

International Specifications not yet Accepted

187,231-2. CHROME ALUM. Chemische Fabrik in Billwarper vorm, Hell and Sthamer Akt.-Ges., and P. Hasenclever, 29, Billbrockdeich, Billbrock, Hamburg. International Convention date, October 12, 1921.

187,231. The process is for obtaining chrome alum crystals from solutions which may contain iron. In an example, a solution of ferrochromium in sulphuric acid is allowed to crystallise until about half the ferrous sulphate is removed. The crystals are removed by centrifugal means and potassium sulphate added to obtain a green chrome alum solution. This is treated with a small quantity of potassium dichromate, sulphuric acid and sulphurous acid. The potassium dichromate is not sufficient to oxidise the iron, and the sulphuric acid is equivalent to the potassium in the dichromate. The violet chrome alum may then be crystallised.

187,232. A solution of ferrochromium in sulphuric or hydrochloric acid is treated with an alkali hydrate or carbonate, or alkaline earth hydrate. Chromium hydroxide is precipitated first, and is then washed, dissolved in sulphuric acid, and the necessary quantity of potassium sulphate added.

187,592. SULPHURETTED HYDROGEN. H. Howard, 1300, Guardian Building, Cleveland, Ohio, U.S.A. International Convention date, October 20, 1921.

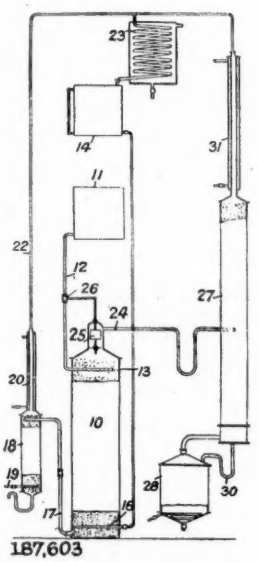
A finely divided metallic sulphide, such as zinc sulphide, is gradually added to sulphuric acid of 52° Bé. strength and sulphuretted hydrogen is evolved. The quantity of sulphuric acid is not sufficient to dissolve all the zinc sulphate produced, and this is allowed to settle and is removed. The liquor is mixed with more acid and used again.

187,601. TREATING ORES. F. L. Smidth & Co., 33, Vestergade, Copenhagen. International Convention date, October 20, 1921.

Powdered ore is heated in a rotary kiln to a temperature below sintering, and air, with or without steam, is blown through it. The ore is then compressed while still hot, to produce a coherent porous mass.

187,603. PYROLIGNEOUS ACID AND OTHER LIQUIDS, PURIFYING. T. J. Brewster, 320, High Street, Perth Amboy, N.J., U.S.A. International Convention date, October 19, 1921.

Crude pyroligneous acid, preferably freed from tarry substances by a previous scrubbing, is treated with a solvent such as ether tetrachlorethane, chloroform, ethyl chloride or bromide, which is volatile, immiscible with water, and of



187,603

substantially different specific gravity, to extract the acetic acid. The acid passes from a tank 11 to a distributor 13 in the top of a tower 10, and ether is supplied from a tank 14 to a distributor 16 at the bottom of the tower. The tower is filled with broken material and the residual liquid is drawn off through a pipe 17 to a column 18 provided with a water-jacketed dephlegmator 20. The ether is removed by blowing steam through a pipe 19 and the ether vapour passes to a condenser 23 and tank 14 for use again. The residual liquid, now free from ether, may be removed from the column 18 and treated with ammonia to form hexamethylene tetramine. The acetic acid extract passes through a pipe 24 to a column 27 having a water-jacketed rectifier 31. The acetic acid and vapour condensate pass into a still 28, the vapour from which passes into the lower end of the column. The liquid from the still is again fractionally distilled, yielding a first fraction containing alcohol; diacetyl and low boiling oils and the residue is extracted with water and returned to the system. The portion boiling between 100°–120° C. is distilled with sulphuric acid, freed from sulphuretted hydrogen by lead acetate, treated with sodium bichromate, and again distilled.

187,605. CONDENSATION PRODUCTS FROM FORMALDEHYDE AND UREA. H. Goldschmidt, 13, Herthastrasse, Grunewald, Berlin, and O. Neuss, 1B, Kirschenallee, Charlottenburg, Berlin. International Convention date, October 17, 1921.

Urea is condensed with not more than 120 per cent. of formaldehyde and 3 per cent. of acid, such as nitric, sulphuric and hydrochloric. The product when moulded resembles meerschaum and porcelain.

187,619. SYNTHETIC RESINS. Consortium für Elektrochemische Industrie Ges., 20, Zielstattstrasse, Munich, Germany. International Convention date, October 20, 1921.

An aldehyde or its product of condensation or polymerisation is subjected for some time to the action of a mineral acid or salt at a slightly raised temperature, and in presence of a solvent. In an example, acetaldehyde is heated to 40° C. with sulphuric acid and then raised to 100° C. until a sample sets on cooling. The product is then raised to 150° C. for a long period, and solidifies to a hard resin. The acid may be replaced by sodium bisulphate solution, and the acetaldehyde by crotonic aldehyde in other examples. The products may be further hardened by fusing with metal oxide, or esterifying with an alcohol such as glycerin. Solutions of these resins may be used as lacquers or polishes. The resins have low melting points and may be added to other resins of higher melting point to render them more fusible.

187,964. DYEING CELLULOSE ACETATE. R. Clavel, 22, Gärtnerstrasse, Basle, Switzerland. International Convention date, October 27, 1921.

A process of dyeing cellulose acetate silk is described, in which the silk is treated with a bath containing dianisidine hydrochloride, magnesium chloride and sodium bicarbonate; then in a diazotising bath; and then in a developing bath containing alpha-naphthylamine hydrochloride and sodium bicarbonate. The material is then treated in a second diazotising bath, and a second developing bath containing α-aminonaphthol, a protective colloid such as boiled-off liquor, and magnesium chloride.

Specifications Accepted, with Date of Application

164,731. Metallic chromium, Process for separating out. E. Liebreich. June 11, 1920.

168,902. Ammonia from nitrogen and hydrogen, Production of. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. September 7, 1920.

169,996. Purifying gases, Apparatus and process for. Koppers Co. October 7, 1920.

174,585. Mechanical roasting furnaces, Method of fastening the scraper arms for. Metallbank und Metallurgische Ges. Akt.-Ges. January 28, 1921.

181,385. Anhydrous metallic chlorides, Process of making. B. H. Jacobson. June 10, 1921.

189,834. Dyestuffs of the anthraquinone series, Manufacture of. A. G. Dandridge, J. Thomas, and Scottish Dyes, Ltd. August 3, 1921.

189,872. Tanning and other extracts, Manufacture of. C. W. Nance. September 8, 1921.

189,873. Tungsten compounds from tungsten ore, Method of and apparatus for producing in a continuous manner. British-Thomson-Houston Co., Ltd. (*General Electric Co.*). September 8, 1921.

189,886. Metals from dross, Method and apparatus for the recovery of. H. Levin. September 12, 1921.

190,025. Arsenical ores and materials, Treatment of. R. Haddan. (*Metallurgical Development Corporation.*) January 3, 1922.

190,032. Gums or resins, Process for the treatment of. L. Eynon and J. H. Lane. January 9, 1922.

190,051. Rubber, Vulcanisation of. Peachey Process Co., Ltd., and S. J. Peachey. January 28, 1922.

190,060. Minerals, Apparatus for the separation of. T. C. Futers. February 14, 1922.

184,184. Acetylene, Process for purifying. Consortium für Elektro-Chemische Industrie Ges. August 1, 1921.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, DECEMBER 28, 1922.

THERE is practically nothing to report this week, owing to the holidays.

The export demand continues, and is now much more healthy than has been the case for a very long time.

General Chemicals

ACETONE continues scarce and the price is extremely firm.

ACID ACETIC appears to be firmer, with a fair demand.

ACID CITRIC is without change, with practically no business to report.

ACID FORMIC has been moderately active, without change in value.

ACID LACTIC unchanged.

ACID OXALIC.—Price is firmer, and the material is in good demand.

ACID TARTARIC.—There has been no movement in this product, but an advance in price is expected.

ARSENIC is as scarce as ever, and high prices are paid for near deliveries.

BARIUM CHLORIDE is uninteresting, and little business has been transacted.

CREAM OF TARTAR unchanged.

FORMALDEHYDE maintains its last advance, and the material is very scarce.

LEAD ACETATE is firmer, but only in moderate demand.

METHYL ALCOHOL continues extremely strong with very short supplies in sight.

POTASSIUM CARBONATE.—Only a small business has been transacted at last-quoted figures.

POTASSIUM CAUSTIC has been as idle as ever.

POTASSIUM PERMANGANATE is firm.

POTASSIUM PRUSSIATE is also extremely firm and in good request.

SODIUM ACETATE in rather short supply, and the price is firm.

SODIUM NITRITE unchanged.

SODIUM PRUSSIATE.—There is slightly more material available, but the price is without change.

ZINC OXIDE is scarce and firm.

Pharmaceutical Chemicals

Since our last report the markets have been practically closed owing to the holidays intervening. Prices have been nominal and are substantially unchanged.

Coal Tar Intermediates

Owing to the intervention of the Christmas Holidays there is practically no change to report in the situation since our last issue.

ALPHA NAPHTHOL continues firm, with no heavy stocks available for prompt delivery.

ALPHA NAPHTHYLAMINE is quiet and easy.

ANILINE OIL.—Some export inquiries have been received.

BENZIDINE BASE.—A certain amount of export inquiry is about, but Continental values continue to rule lower than current quotations in this country.

BETA NAPHTHOL is featureless.

BETA NAPHTHYLAMINE is without change in price.

DIPHENYLAMINE is steady at last quoted values.

"H" ACID.—First-class material is short for immediate delivery.

NAPHTHIONATE OF SODA.—Some home orders have been placed.

PARANITRANILINE has been inquired for on home account.

PARAPHENYLENEDIAMINE.—A few home orders have been received.

Coal Tar Products

Owing to the Christmas Holidays intervening there is no great change in the market situation from last week.

90% BENZOL remains fairly steady at 1s. 8d. per gallon on rails in the North, and 1s. 11d. to 2s. per gallon in London.

PURE BENZOL has a poor demand, and is quoted at about 2s. per gallon in the North, and 2s. 3d. to 2s. 4d. in London.

CREOSOTE OIL is scarce, and maintains a firm tone. It is worth 6¾d. to 7d. per gallon in the North, and from 7½d. to 8d. per gallon in the South.

CRESYLIC ACID is plentiful, and the Dark quality, 95/97%, is quoted at about 1s. 6d. per gallon on rails, while the Pale quality, 97/99%, is worth from 1s. 9d. to 1s. 10d. per gallon.

SOLVENT NAPHTHA is steady at about 1s. 7d. per gallon on rails in the North, and 1s. 10d. to 2s. per gallon in London.

HEAVY NAPHTHA is in poor demand, and is quoted at about 1s. 6d. per gallon on rails.

NAPTHHALENE has been slightly more active. Crude and whizzed qualities with lower melting points are worth from £5 to £7 per ton, while hot pressed is worth about £8 10s. to £9 per ton.

PITCH.—The holidays are naturally interfering with business, but the market remains firm with few sellers, especially for near delivery.

Sulphate of Ammonia

The demand for export continues to be good. The new prices fixed by the British Sulphate of Ammonia Federation for January and February home deliveries show an advance of 5s. per ton on the autumn prices.

Current Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	5	to	0	1	7
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	55	0	0	to	60	0	0
Carbolic, cryst. 39–40%	lb.	0	0	7	to	0	0	7½
Citric	lb.	0	1	9	to	0	1	10
Formic, 80%	ton	59	0	0	to	60	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	41	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	27	0	0	to	29	0	0
Oxalic	lb.	0	0	7½	to	0	0	7½
Phosphoric, 1.5	ton	40	0	0	to	42	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Sulphuric, 92–93%	ton	6	10	0	to	7	10	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	2½	to	0	1	3
Alum, lump	ton	13	0	0	to	13	10	0
Alum, chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	50	0	0	to	55	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	65	0	0	to	68	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	70	0	0	to	75	0	0
Barium, carbonate, 92–94%	ton	15	0	0	to	16	0	0
Barium, Chlorate	ton	65	0	0	to	70	0	0
Barium Chloride	ton	18	0	0	to	19	0	0
Nitrate	ton	35	0	0	to	38	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	11	0	0	to	—		
Borax crystals	ton	28	0	0	to	32	0	0

	Per	£	s.	d.		£	s.	d.
Calcium acetate, Brown	ton	10	10	0	to	11	10	0
,, ,, Grey	ton	15	10	0	to	16	0	0
Calcium Garbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	0	0	to	7	0	0
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein technical	ton	95	0	0	to	100	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	27	10	0	to	28	10	0
Cream Tartar, 98–100%	ton	100	0	0	to	102	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	90	0	0	to	95	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerin, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	4	to	0	2	5
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	42	0	0	to	47	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	22	10	0	to	23	10	0
Magnesium chloride	ton	5	10	0	to	6	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	7	10	0	to	8	0	0
Sulphate (Druggists')	ton	10	0	0	to	11	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	70	0	0	to	75	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	32	0	0	to	33	0	0
Potassium bichromate	lb.	0	0	6	to	0	0	6½
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	43	0	0	to	45	0	0
Permanganate	lb.	0	0	9	to	0	0	9½
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb	0	1	6½	to	0	1	7½
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to	—		
Seconds	cwt.	3	0	0	to	—		
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4¾	to	0	0	5
Bisulphite 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	0	0	to	20	10	0
Caustic, 76%	ton	21	0	0	to	22	0	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	10	10	0	to	12	0	0
Nitrite, 96–98%	ton	29	10	0	to	30	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	11	10	0	to	12	0	0
Sulphide, solid, 60–62%	ton	17	0	0	to	18	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	40	0	0	to	42	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	11	0	0	to	12	0	0
Roll	ton	11	0	0	to	12	0	0
Tartar emetic	lb.	0	1	3	to	0	1	4
Theobromine	lb.	0	12	6	to	0	13	0
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	37	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	16	10	0	to	17	10	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	2	10	to	0	3	0
Acetanilid	lb.	0	1	4	to	0	1	6
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	9	to	0	3	0
Salicylic, B.P.	lb.	0	1	4	to	0	1	6
Tannic, leviss	lb.	0	3	4	to	0	3	6
Amidol	lb.	0	8	6	to	0	8	9
Amidopyrin	lb.	0	14	6	to	0	15	0
Ammon ichthosulphonate	lb.	0	2	0	to	0	2	3
Barbitone	lb.	0	12	0	to	0	13	0
Beta naphthol resublimed	lb.	0	1	9	to	0	2	0
Bromide of ammonia	lb.	0	0	8½	to	0	0	9
Potash	lb.	0	0	7½	to	0	0	8
Soda	lb.	0	0	8	to	0	0	8½
Caffeine, pure	lb.	0	12	0	to	0	12	3
Calcium glycerophosphate	lb.	0	5	6	to	0	6	0
Calcium lactate	lb.	0	2	0	to	0	2	3
Calomel	lb.	0	4	9	to	0	5	0
Chloral hydrate	lb.	0	4	3	to	0	4	6
Cocaine alkaloid	oz.	0	18	6	to	0	19	0
Cocain hydrochloride	oz.	0	14	6	to	0	15	0
Corrosive sublimate	lb.	0	4	6	to	0	4	9
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	1	7	to	0	1	7½
B.P. (75–80% eucalyptol)	lb.	0	1	8	to	0	1	8½
Guaiacol carbonate	lb.	0	8	3	to	0	8	6
Liquid	lb.	0	9	0	to	0	9	6
Pure crystals	lb.	0	10	0	to	0	10	6
Hexamine	lb.	0	3	0	to	0	3	3
Hydroquinone	lb.	0	3	3	to	0	3	6
Lanoline anhydrous	lb.	0	0	7½	to	0	0	8
Lecithin ex ovo	lb.	0	18	6	to	1	0	0
Lithia carbonate	lb.	0	10	0	to	0	10	6
Methyl salicylate	lb.	0	2	1	to	0	2	3
Metol	lb.	0	10	0	to	0	10	6
Milk sugar	cwt.	4	17	6	to	5	2	6
Paraldehyde	lb.	0	1	4	to	0	1	6
Phenacetin	lb.	0	4	10	to	0	5	0
Phenazone	lb.	0	6	9	to	0	7	0
Phenolphthalein	lb.	0	5	0	to	0	5	3
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3		—		
Resorcine, medicinal	lb.	0	5	9	to	0	6	0
Salicylate of soda powder	lb.	0	1	10	to	0	2	0
Crystals	lb.	0	2	0	to	0	2	3
Salol	lb.	0	2	1	to	0	2	4
Sulphonal	lb.	0	14	0	to	0	14	6
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	12	0	to	0	12	6
,, soda salicylate	lb.	0	8	6	to	0	9	0
Vanillin	lb.	1	5	0	to	1	6	6

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	2	9	to	0	3	0
Alphanaphthylamine	lb.	0	1	9	to	0	1	10
Aniline oil, drums extra	lb.	0	0	10	to	0	0	11
Aniline salts	lb.	0	0	10	to	0	0	11
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	3	to	0	3	6
Benzidine, base	lb.	0	5	0	to	0	5	3
Benzidine, sulphate	lb.	0	4	6	to	0	5	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	4	6	to	0	5	0
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	3	9	to	0	4	0
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	7	to	0	1	9
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	0	to	0	4	3
H-Acid	lb.	0	5	6	to	0	6	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	6	to	0	4	9
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	2	6	to	0	2	9
Naphthionate of Soda	lb.	0	2	9	to	0	3	0
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitrobenzol	lb.	0	0	9	to	0	0	9½
Nitronaphthalene	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	0	to	0	1	2

	Per	£	s.	d.		£	s.	d.
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	0	to	0	1	6
Orthonitrotoluol	lb.	0	0	6	to	0	0	8
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Para-amidophenol, hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	3	to	0	3	6
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	5	9	to	0	6	3
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	6	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	7	0	to	0	7	6
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

(Prices supplied by Essences and Synthetics, Ltd.)

ESSENTIAL OILS

	£	s.	d.
Aniseed Star and Redship, c.i.f. price 1/11¼	0	2	2
Bergamot, 14/0 to	0	14	6
Bois de Rose female	0	10	6
Camphor white, per cwt.	4	5	6
Cassia 80–85%	0	8	9
Cedarwood	0	1	6
Cinnamon Ceylon leaf, per oz.	0	0	4¼
Citronella Ceylon	0	2	5
Clove oil	0	6	0
Dill	0	13	0
Geranium Bourbon	1	6	0
Gingergrass	0	9	0
Lemon	0	3	0
Lime West Indian Distilled	0	2	0
Mandarin	0	16	0
Mint dementholised Kobayashi's or Suzuki's	0	8	6
Orange Sicilian	0	9	6
Parma rosa	0	16	0
Patchouli	1	17	6
Peppermint American	0	13	6
Petitgrain Paraguay	0	7	0
Sassafras	0	5	0
Spearmint	0	14	0

SYNTHETICS

Benzyl acetate	0	2	9
Benzyl benzoate	0	2	9
Linalol	0	19	6
Linalyl acetate	1	4	6
Terpeniol	0	3	0
Coumarine	0	11	0
Heliotropine	0	5	6
Ionone 100%	1	7	0
Geraniol Java	0	6	6
Geraniol Parma rosa	1	10	0
Rhodinol extra	2	10	0
Methyl salicylate	0	2	0
Citral	0	10	0
Musk xylol	0	10	6

Scientific Novelties Exhibition

IN connection with the Hospitals of London Combined Appeal a Scientific Novelties Exhibition is being held at King's College, Strand, from December 28 to January 10. It has been organised by the London University Colleges, the schools of the University and the Polytechnics jointly, with the assistance of the Royal Microscopic Society, the Photo-Micrographic Society, and the Queckett Club. Members of the scientific staffs of the University and the schools will assist with exhibits and demonstrations of scientific apparatus, while an extensive scheme of lectures will be delivered on a wide range of subjects by leading authorities in the separate departments. The exhibition was opened by Viscount Burnham on Thursday, and will be open on each weekday from 2 p.m. to 5 p.m., and from 6 p.m. to 9 p.m. The programme of lectures includes: "Crystal Models," by Sir W. H. Bragg; "Drops and Globules," by Mr. C. R. Darling, F.I.C.; "Liquid Air," by Mr. R. R. Butler, A.I.C.; "Explosives," by Sir Robert Robertson, F.R.S.; "Liquid Air," by Professor O. W. Richardson, F.R.S.; and "Flames and Explosions," by Dr. F. J. Drakeley, A.I.C.

Sulphuric Acid Manufacture

(Continued from page 938)

itself reduction to N_2O might well occur. The lecturer's experience was that with nitric acid of under 60 per cent. a disproportionate amount was required, and such acid should not be used.

Apart from these two particular cases reduction of nitric oxide to nitrous oxide or further could hardly occur. The chief part of the nitrogen lost probably passed away as unabsorbed N_2O_3 through the Gay-Lussac towers. With the increasing dilution of the N_2O_3 in the exit gases as they passed through the towers the rate of absorption of the N_2O_3 was progressively diminished, and a point was evidently reached where the addition of further Gay-Lussac space would be uneconomical. This very dilute escaping gas could not be estimated by ordinary laboratory methods. A pull tube would be ridiculous as an absorbing mechanism for gases which had escaped absorption in such a gigantic piece of apparatus as a Gay-Lussac tower.

Other Sources of Loss

Other sources of loss were the fact that Glover acid as it passed away for use or sale always contained traces of oxides of nitrogen, and chamber acid, if used, larger quantities. Arsenious oxide, if present in the source of sulphur, might also effect a reduction to N_2O, as would ammonia gas or carbon monoxide, which were liable to be present in SO_2, produced from spent oxide. In fact, works using spent oxide frequently consumed 50–100 per cent. more nitre than those using pyrites. There were also accidental gas leakages, etc.

The Excess Oxygen Problem

Another interesting problem in a sulphuric acid plant from the point of view of theory was the excess oxygen required in the gases. Thirty years ago the general opinion was that the proportion should be 8 per cent. of oxygen in the exit gases. Later 5–6 per cent. became more general. Lunge (1903) stated that in England 7–8 per cent., in Germany 4–8 per cent., in France 3–4 per cent. was usual. The theoretical explanation of these varying empirical figures was simply that the excess of oxygen necessary depended on the Gay-Lussac tower capacity. A deficiency of oxygen meant that unoxidised NO escaped, but if the line of passage of gas through the Gay-Lussac towers was increased a lower percentage would serve. The tendency in all countries had been to increase the size of Gay-Lussac towers; hence the tendency to find a lower oxygen excess sufficient. In France what was called "forced working" with very large Gay-Lussac towers was adopted by 1890, and hence the lower figure in French practice quoted by Lunge. The reaction velocity constant of the oxidation of nitric oxide had been determined by Nernst, and from this it should be possible to calculate the oxygen excess necessary for a given Gay-Lussac space.

The minimum excess necessary should be used, as otherwise the greater dilution of the gas resulted in decreased make and losses of nitrogen. At Flimly the figure he considered right was 4·0–4·5 per cent., and if it fell below this it resulted in sublimation on the burners rather than injury to the nitrogen recovery.

Another question for the chemist in sulphuric acid manufacture was the question of the corrosion of lead. Hitherto it had been mainly investigated from the point of view of the lead manufacturer, but there was a crying need for research from the side of the acid maker.

Benn Brothers' Social Circle

AT King George's Hall, Tottenham Court Road, London, on December 22, the dramatic section of Benn Brothers' Social Circle gave a performance of Noel Coward's comedy, "I'll Leave It To You," before a crowded audience. The play was stage-managed and produced by Mr. Herbert J. Wrench, and the cast comprised Clarice A. Goodchild, Bernard C. Holding, Margot Hughes Carr, Elsie M. Burgess, John D. Tutin, Dora Penn, Cedric H. J. Aldworth, Phyllis I. Trimby, Doris M. Gough, and Herbert J. Bryant. The incidental music was under the direction of Miss H. Aldworth. At the close of the performance Sir Ernest Benn commented on the spirit of loyalty and camaraderie which actuated the members of the staff.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, *December* 27, 1922.

OWING no doubt to the holidays the number of inquiries during the past few days has been appreciably smaller.

There is nothing of importance to record, prices being fairly steady.

Industrial Chemicals

ACETONE.—The market is firm and further business has been done around £120 per ton.

ACID ACETIC.—Glacial, 98/100%, £55 to £58 per ton, ex wharf. Lower strengths inclined to be higher, 80% technical about £42 to £44 per ton; 80% pure about £43 to £46 per ton.

ACID BORACIC.—Crystal or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K. stations.

ACID CITRIC.—In little demand, 1s. 7d. per lb., ex store.

ACID FORMIC, 85%.—Moderate inquiry £54 per ton.

ACID HYDROCHLORIC.—Price remains unchanged at 6s. 6d. per carboy, ex works.

ACID NITRIC, 84%.—Quoted £27 per ton, ex station.

ACID OXALIC.—Price about 7d. to 7¼d. per lb.

ACID SULPHURIC.—144°, £4 per ton; 168°, £7 5s. per ton, ex works in full loads; dearsenicated quality £1 per ton more.

ACID TARTARIC.—Quoted 1s. 2d. per lb., ex store.

ALUM CHROME.—Price about £25 to £26 per ton, f.o.b. U.K. Early shipment.

ALUM LUMP POTASH.—In little demand, £12 10s. to £13 per ton, ex store.

AMMONIA ANHYDROUS.—Moderate inquiry, 1s. 6d. per lb., ex station.

AMMONIA CARBONATE.—Lump, 4d. per lb.; ground, 4¼d. per lb., delivered.

AMMONIA MURIATE.—Grey Galvanisers, £31 to £32 per ton; fine white crystals offered at £26 per ton, c.i.f. U.K.

AMMONIA SULPHATE.—25¼%, £15 per ton; 25¾%, neutral quality, £16 3s. per ton, ex works.

ARSENIC, WHITE POWDERED.—Very hard to obtain for spot delivery. Quoted £63 to £65 per ton, January delivery.

BARIUM CHLORIDE, 98/100%.—Offered at £18 to £19 per ton, in little demand.

BARYTES.—Finest white English £5 5s. per ton, ex works. Continental offered at about the same prices ex store various ports.

BLEACHING POWDER.—Price from January 1, £11 10s. per ton, ex station, spot delivery.

BORAX.—Crystal or granulated, £28 per ton; powdered, £29 per ton, carriage paid U.K. stations.

CALCIUM CHLORIDE.—Price from January 1, £5 15s. per ton, ex quay or station. Offered from Continent at about £4 per ton, c.i.f. U.K.

COPPER SULPHATE.—Quoted £26 per ton, f.o.b. U.K.

COPPERAS, GREEN.—Price about £3 15s. to £3 17s. 6d. per ton, ex works.

FORMALDEHYDE, 40%.—Inclined to be scarce. Now quoted £88 to £89 per ton, ex wharf.

GLAUBER SALTS.—Quoted £4 per ton, ex store.

LEAD.—Red lead, £38 15s. per ton; white lead, £50 15s. per ton. Carriage paid U.K. stations, in 5-ton lots.

LEAD ACETATE.—Fine white crystals offered at £37 per ton, c.i.f. U.K. ports.

LEAD NITRATE.—Price about £42 per ton, ex wharf.

MAGNESITE, GROUND CALCINED.—£7 to £10 per ton, ex store.

MAGNESIUM CHLORIDE.—Offered for prompt shipment from Continent at £2 17s. 6d. c.i.f. U.K. Spot lots at about £4 per ton, ex store.

MAGNESIUM SULPHATE (EPSOM SALTS).—Price now £7 per ton for commercial quality; £8 15s. B.P. quality, in bags, ton lots.

NAPHTHALENE.—Sublimed flakes offered at £12 per ton, ex works.

POTASSIUM BICHROMATE.—English make, 6d. per lb., delivered.

POTASSIUM CARBONATE, 88/92%.—In little request, £27 per ton, ex store spot.

POTASSIUM CAUSTIC, 88/92%.—Spot material at about £29 10s. per ton, ex store.

POTASSIUM, CHLORATE.—Crystals or powder, 3½d. per lb., ex store.

POTASSIUM MURIATE, 90/95%.—Offered at £10 per ton, f.o.r. works, basis 80%.

POTASSIUM NITRATE (SALTPETRE).—Offered at £25 per ton, c.i.f. U.K.

POTASSIUM PERMANGANATE.—B.P. crystals quoted 7½d. per lb. ex store.

POTASSIUM PRUSSIATE (YELLOW).—Unchanged at 1s. 6d. to 1s. 6½d. per lb.

POTASSIUM SULPHATE, 90/92%.—Quoted £15 per ton, f.o.b. U.K. basis 90%.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station; m.w. quality, 30s. per ton less from January 1.

SODIUM BICHROMATE.—English make 4½d. per lb., delivered U.K.

SODIUM CARBONATE.—Soda crystals, £5 5s. to £5 10s. per ton, ex quay or station; alkali, 58%, from January 1, £8 17s. 6d. per ton, ex station, spot delivery.

SODIUM CAUSTIC.—Prices from January 1, 76/77%, £21 10s.; 70/72%, £19; 60/62%, broken, £21 5s.; 96/98% powdered, £24 17s. 6d. per ton, ex stations 4-ton lots.

SODIUM CHLORATE.—Quoted 3¼d. per lb., ex store.

SODIUM HYPOSULPHITE.—Commercial, £10 10s. per ton, ex station; pea crystals, about £16 10s. per ton.

SODIUM NITRATE.—96/98%, refined quality, £12 10s., f.o.r.

SODIUM PRUSSIATE (YELLOW).—Price about 10¾d. per lb., ex store.

SODIUM SULPHATE (SALTCAKE 95%).—Good export inquiry. Price for home consumption, £4 per ton, delivered station.

SODIUM SULPHIDE, 60/62%.—Offered from Continent at £14 5s. per ton, c.i.f. U.K.; 30/32% crystals, about £8 10s. per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks of Sicilian thirds available at £3 10s. to £3 15s per ton, ex depot; flowers £11 per ton; roll, £10 per ton; rock, £9 per ton; ground, £9 per ton. Prices nominal. Slight inquiry for roll.

TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.

ZINC SULPHATE.—Price about £13 per ton, ex wharf.

Coal Tar Intermediates and Wood Distillation Products

ANTHRAQUINONE.—Home inquiry. Price quoted, 3s. 2d. per lb., delivered.

BENZIDINE BASE.—Export inquiries. Price quoted, 6s. 6d. per lb., 110% basis, f.o.b.

BETANAPHTHOL.—Offered for export at 1s. 2d. per lb., f.o.b.

BETANAPHTHOL, R.—Offered for export at 1s. 3d. per lb., f.o.b.

BETA NATHTHYLAMINE.—Home inquiry. Price, 4s. 6d. per lb., delivered.

CLEVES ACID.—Home inquiry. Price quoted, 4s. 2d. per lb., 100% basis, delivered.

DI-ETHYL ANILINE.—Export inquiry. Price quoted, 4s. 7d. per lb., drums included.

DIMETHYLANILINE.—Export inquiry. Price quoted, 2s. 7d. per lb., drums included.

DINITRO NAPHTHALENE.—Supplies are offered at £90 per ton, delivered.

GAMMA ACID.—Export inquiry. Offered at 13s. 9d. per lb., 100% basis.

METANITRANILINE.—Offered for export at 5s. 6d. per lb., f.o.b.

METAPHENYLENEDIAMINE.—Offered at 5s. 6d. per lb., delivered.

META TOLUYLENE DIAMINE.—Offered at 5s. per lb.

MONONITROTOLUENE.—Home and export inquiries. 11d. per lb., carriage paid, or f.o.b., drums extra.

NITRONAPHTHALENE.—1s. per lb., delivered.

ORTHO TOLUIDINE.—Offered for export at 1s. 5d. per lb., f.o.b., drums included.

PARA DICHLORBENZOL.—Export inquiry. Price quoted, £50 per ton, f.o.b.

PARANITRANILINE ORTHO SULPHONIC ACID.—Home inquiry. Price quoted 5s. 3d. per lb., 100% basis, carriage paid.

PARANITRANILINE.—Offered for export at 3s. per lb., f.o.b.

PARANITROCHLORBENZOL.—Export inquiry. Price quoted, 1s. 4d. per lb., f.o.b.

PARANITROPHENOL.—Home inquiry. Price quoted, 2s. 4d. per lb., delivered.

PARAPHENYLENEDIAMINE.—Offered at 12s. per lb. on 100% basis.

" R " SALT.—Home inquiry. Price 2s. 5d. per lb. 100% basis.

Company News

BENN BROTHERS, LTD.—An interim dividend of 5 per cent. on the ordinary shares is payable on January 2.

ENGLISH CHINA CLAYS.—A dividend of 3½ per cent., less tax, is payable on the preference shares for the half year ended June 30, 1921.

AMERICAN CYANAMID CO.—A dividend of 1½ per cent. on the preferred stock is payable on January 2 to holders of record December 26.

PINCHIN, JOHNSON AND CO.—The usual dividend has been declared on the preference shares at the rate of 6½ per cent. per annum, less tax, for the six months to December 31, and is payable on January 1.

AMALGAMATED ZINC (DE BAVAY'S).—A dividend (No. 32) of 1s. per share, less United Kingdom income-tax at 5s. and Federal income-tax (absentee tax) at 7d. in the £, will be paid on January 31 next to all members on the London register on January 16 next.

PREMIER OIL CO.—In announcing that a meeting of the company will be held early in 1923, the directors state that resolutions will be submitted authorising a reduction in nominal value of the company's shares, with a view to a part return of capital by way of distribution to shareholders.

UNITED ALKALI CO., LTD.—A meeting of the holders of the 5 per cent. debenture stock was convened for yesterday (Friday) for the purpose of considering a resolution reducing the period of notice required to be given by the company to stockholders of intention to redeem the stock from six months to two months.

VAN DEN BERGHS', LTD.—Announcement is made of the declaration of an interim dividend of 1s. per share (20 per cent.) on the ordinary shares for the first half of 1922. The sum brought into the current year's accounts was £106, 964, after allowing £25,543 for income-tax. The dividend on the ordinary shares for 1921 was passed.

METALS EXTRACTION CORPORATION.—The report for the year ended September 30 last states that provisional terms have been arranged for the erection of process works upon a site with harnessed water-power sufficient for a 100 tons a day plant. The balance-sheet shows that the total of the general expenditure account has been increased from £59,463 to £61,736.

HARGREAVES BROTHERS AND CO., LTD.—At an extraordinary general meeting of shareholders held on December 22, an agreement was unanimously approved by which all of the company's assets were purchased by Reckitt and Sons, Ltd., of Hull. The purchase figure is £355,000. Preference shareholders will receive 5s. or 6s. per share, with the option of purchasing Reckitt's shares at £3.

OILFIELDS OF ENGLAND, LTD.—The report to September 30 last states that as the development of the company's properties at Kelham, near Newark, has not yet reached the productive stage, the entire expenditure incurred thereon during the year has again been capitalised. Shareholders were advised by circular dated September 18 last of position of operations on the company's Kelham Field at that date; work has since been steadily proceeded with and No. 2 well has now reached a depth of 1,717 ft.

BRITISH BURMAH PETROLEUM CO.—After deducting debenture interest, and depreciation, etc., the profit of the British Burmah Petroleum Co. for the year ended July 31 last amounted to £69,962 (against £93,334). To this is added £9,915 brought forward, surplus on realisation of investments £4,895, and refunds of taxes, £29,244, giving a disposable profit of £114,017. The interim dividend absorbed £31,134, a sum of £32,556 has been transferred to sinking fund account, and the directors propose a balance dividend of 4½d. per share, making 7½d. per share, free of tax, for the year (against 1s. per share). This dividend is payable on February 23 next.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
Algiers	Chemical products	—
New York	Chemicals, colours, oils, wax, etc.	—
New York	Druggists' sundries, etc.	—
Spain	Pitch	—

Var Oil and Coal Co.

Success of New Shale Treatment

SPEAKING at the third annual meeting of the Var Oil and Coal Co., Ltd., held on December 21, at Winchester House, London, Mr. Leslie Urquhart (the Chairman) said that following tests undertaken to find the most suitable type of retort to treat their rich Boson shale they evolved two types of retort, and commenced erection of one of each type, in order that they could determine, under commercial conditions, which type was the more suitable to their requirements. The Pan retort, which was erected first, proved mechanically sound and gave a high extraction of oil from the shale, but the thermal efficiency was low, although the company's engineers believed this difficulty could be overcome by certain modifications. Erection of the twin retort was completed only last month, and he was pleased to say that in operation it had fulfilled their highest expectations.

Continuing, the Chairman said the extraction of oil from shale on a large scale met with success only in the Scotch fields, where shale companies had a long and profitable life. Whereas the type of retort at present in use in Scotland successfully treated shales yielding from 18 to 30 gallons of crude oil per ton of shale, this Scotch type of retort was unsuitable for the treatment of the rich Boson shale. Their new twin retort was of the continuous type, continuous in feed as well as in discharge. Further, perfect control of temperature was possible, a fact which played an important part in the successful treatment of any high grade shale. One of the greatest difficulties their technical staff experienced in the earlier stages, when various types of retorts were being tested, was the tendency of the rich Boson shale to swell and stick fast in the retort, thus rendering continuous distillation out of the question. In the twin retort this difficulty has been completely overcome, and the latest advices received from Mr. Queneau (the managing director of the French company) stated that he was obtaining no less than 295 litres of crude oil per metric ton, which was equivalent to 65·8 gallons per English ton of shale treated. Further, the capital cost of erection of their type of retort, based on tonnage capacity, was considerably lower than that of the Scotch type of retort, and the labour costs per ton of shale treated would be very low. Estimates were now being prepared for the installation of a plant with an initial capacity of 50 tons of shale daily. It was anticipated that it would be better and more economical to build these new twin retorts of a capacity larger than those now in operation. It was probable that with a larger size retort the fixed or uncondensable gases would be not only sufficient to heat the retort itself, but there would be a surplus of gas for boiler-heating. With these considerations in view it was proposed to erect new retorts of a daily capacity of 8 tons each, providing for the initial treatment of a minimum of 50 tons of shale daily. The lay-out of the new plant would be such that additional retorts could be easily and quickly added. The topping plant and petrol refinery to deal with the oil from the new plant had been completed already, but it would be necessary to install mechanical conveyors, additional boilers, and additional power plant for both mining and retorting.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

ASHTON, Mr. S., Nuneaton, druggist. (C.C., 30/12/22.) £17 18s. 6d. November 11.

CLINTON AND CO., 211, Every Street, Manchester, chemists. (C.C., 30/12/22.) £14 10s. November 1.

NORRIS BROS., LTD., 107/111, Moorgate Station Chambers, E.C., chemical manufacturers. (C.C., 30/12/22.) £29 14s. 10d. November 1.

SMITH, Mr. G. (trading as SMITH'S SYRUP SUPPLIES), 308, Smithdown Road, Liverpool, manufacturing chemist. (C.C., 30/12/22.) £18 16s. 1d. November 7.

Deeds of Arrangement

HARRISON, Arthur (trading as R. W. HARRISON AND CO.), Navigation Mills Blackburn, soap and varnish manufacturer. (D.A., 30/12/22.) Trustee, W. Hare, Central Chambers, Richmond Terrace, Blackburn, C.A. Liabilities unsecured, £5,419; assets, less secured claims, £1,100.

KABBUR, Krishnarao Hanmantrao, (trading as K. H. KABBUR AND CO.), 25, Brazennose Street, Manchester; 36, Hatton Garden, London; 2, Rue Meyerbeer, Paris; Bergestrasse 12–14, Hamburg; Ballard Road Fort, Bombay; 673, Man Janakara Street, Madura, Habasham Phatak, Delhi, 95, Clive Street, Calcutta; 34, Govindappa Naick Street, Madras; and 47, Lewis Street, Rangoon, and residing at Kamala House, Old Hall Road, Broughton Park, Salford; dye, colour and general merchant. (D.A., 30/12/22.) Trustee, R. Miller, 42, Spring Gardens, Manchester, C.A. Secured creditors, £49,415; liabilities unsecured, £74,596; assets, less secured claims, £31,779. The following are creditors:—Central Importing Agency, London, £50,992; Boake, Roberts and Co., London, £156; Forster and Gregory, Ltd., London, £114; Shanks and Co., London, £107; Hogg and Co., Ltd., Blackburn, £321; Chaganlal and Co., Bombay, £620; McCormack, F., Disley, £3,914; Verein fuer Chem., Karlsbad, £643; United Alkali, Liverpool, £241; British Dyestuffs Corporation, Manchester, £583; Brining, Robert, and Co., Manchester, £535; Greengate Colour Co., Manchester, £124; Burgess Ledward and Co., Ltd., Manchester, £117; Henchman, W., Manchester, £200; Verona Chem. Co., New Jersey (U.S.A.), £150; Mitchell Bros., Sowerby Bridge, £1,275; Alliance Chemical Co., Stretford, £194; Matley, H., Stretford, £1,000; Fabrick Chem. Werke Producn., Vondelingenplaat, £187.

SHARP, Jack, and COHN, Isidore Leib, (trading at 2, Harding Street, Brindle Heath Road, Pendleton, as COHN AND SHARP), candle makers. (D.A., 30/12/22.) Trustee, A. T. Eaves, 15, Fountain Street, Manchester, C.A. Secured creditors, £26; liabilities unsecured, £4,876; assets, less secured claims, £2,196. The following are creditors:—Cowles, E., London, £677; British Petroleum Co., Ltd., Eccles, £58; Woodward, Jas., and Co., Manchester, £1,033; Sugarman, C., Manchester, £797; Ofchinsky, I., Manchester, £1,037; Morgan, Crossly and Co., Ltd., Miles Platting, £160; Harris, T. S., and Co., Ltd., St. Mary's Gate, £76; Hill Nest Oil Co., £22.

Receivership

SHARP (J. B. AND W. R.), LTD. (R., 30/12/22.) Sir William McLintock, K.B.E., C.V.O., of Bond Court House, Walbrook, E.C.4, was appointed receiver on December 12, 1922, under powers contained in debentures dated August 11th, 1921.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

GREENWOOD (G. L.) AND CO., LTD., Keighley, wholesale chemists. (M., 30/12/22.) Registered December 9, £6,000 debentures; general charge. *Nil. August 17, 1922.

London Gazette

Company Winding-Up Voluntarily

ELECTRO-METALLURGICAL EXTRACTION, LTD.—(C.W.U.V., 30/12/22.) J. A. Charlton, Bank of England Chambers, Tib Lane, Manchester, Incorporated Accountant, appointed liquidator. Meeting of creditors at the offices of Messrs. Handley Wilde and Charlton, Bank of England Chambers, Tib Lane, Manchester, on Thursday, January 4, 1923, at 11 o'clock a.m.

Notice of Dividend

HEESCH, Ernest Edwin Ferdinand, Stansfield Mill Yard, 77 and 79, Kirkstall Road, Leeds, as oxy-acetylene welder and chemical manufacturer. Amount per £, 10d. Supplemental. Payable, January 9, 1923, Official Receiver's Office, 24, Bond Street, Leeds.

New Companies Registered

LYDDON AND CO., LTD., 110, Cannon Street, London. Manufacturers of and dealers in paper and articles made from paper or pulp, etc. Nominal capital, £10,000 in £1 shares.

METAL PRESERVING CO., LTD., 10, Victoria Street, Liverpool. Manufacturers, distillers, refiners of and dealers in metal, furniture and grate polishes and pastes, etc. Nominal capital, £3,000 in £1 shares.

T. WOOD AND SONS (LUTON), LTD., 150, Southampton Row, London, W.C.1. Chemical plumbers, cabinet makers, etc. Nominal capital, £10,000 in 9,500 8 per cent. cumulative preference shares of £1 and 10,000 deferred shares of 1s. each.

Commercialisation of the Peachey Process

SPEAKING on December 14 at the annual meeting of the Peachey Process Co., Ltd., Sir J. P. Hewett said the company had issued licences in this country for the vulcanisation of crude rubber articles, such as boot and shoe soles, mats, etc., and for the rubber surfacing of leather. The production of moulded goods by the two-solution method had been perfected, and arrangements for manufacture should be completed in the spring. Abroad an exclusive licence for the process in Belgium had been granted, and the manufacture should be started as soon as the plant was completed, whilst in Ceylon and Malaya a licence had been given for the production, in the first place, of crude rubber articles, from which expansion in other directions would result.

Manufacture of Logwood Extracts

MESSRS. T. S. TODD AND CO., of 42, Broadway, New York, U.S.A., announce that they have recently finished the installation of new machinery at their factory in Santo Domingo, West Indies, where they manufacture their "Domingo" brand of logwood extract products, *i.e.* logwood extract liquid, solid, and crystals, and hematine liquid and crystals. Santo Domingo logwood or "Campeche" has a world-wide reputation for its hematoxalyn or dye value content, and as Messrs. Todd's factory is located in the section where this wood grows they are able to secure ample supplies of selected wood which they know to be best adapted for producing high quality products. The firm state that the "Domingo" products are guaranteed to be absolutely free from any adulterant, and to contain only the real dye value of the wood, and none of the sap or resin, which merely add weight and have no dye value.

TRADE GUIDE

CHEMICAL AGE

THE Trade Guide is a compact and handy form of reference to a representative list of firms engaged in various branches of the Industry. In most cases fuller particulars may be found by referring to the displayed advertisement elsewhere.

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MURIATIC
DIPPING
BATTERY
NITRIC

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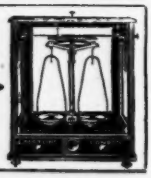

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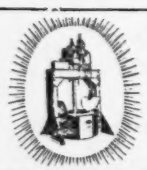

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CHEMICAL AGE

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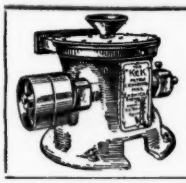

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